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Editor **M. R. D. Seaward,** MSc, PhD, DSc, FLS, The University, Bradford BD7 1DP

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CHANGES IN POPULATIONS OF KITTIWAKES *RISSA TRIDACTYLA* AND COMMON GUILLEMOTS *URIA AALGE* BREEDING ON THE FLAMBOROUGH HEADLAND, 1967-1994

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ABSTRACT

Data from photographs of the same cliff sections on the Flamborough Headland taken in 1967, 1974 and 1994 show that in these years Kittiwake numbers remained stable while Common Guillemot numbers increased significantly. It is shown that counts of birds on photographs of sample plots are repeatable and can be used to assess population changes at seabird colonies.

INTRODUCTION

The 11 km of chalk cliffs on the north side of the Flamborough Headland in East Yorkshire (grid ref. TA2570) provide nest sites for a large colony of Kittiwakes *Rissa tridactyla*, Common Guillemots *Uria aalge* and other birds, amounting to around 150,000 breeding pairs of eight species of seabird. Between 1952 and 1987 attempts were made to count the breeding seabirds on the entire headland. The results for Kittiwakes and Common Guillemots, the two most numerous species, are summarised in Table 1. In 1952, 1964 and the late 1970s, counts were carried out by individual enthusiasts; in 1969 and 1985-1987 they were part of national schemes. These counts showed increases in the breeding numbers of all the Flamborough Headland seabirds. However, methods were not standardised from one count to another, and the counts are probably not comparable. In this paper we describe counts made from photographs of the same sections of cliffs, called study plots, in 1967, 1974 and 1994 which indicate that, while Kittiwake numbers remained stable in this period, the Common Guillemot population increased significantly. The method used here is not suitable for the estimation of total numbers of birds breeding on the headland, but is repeatable and, provided the plots are representative of the whole colony, suitable for monitoring population changes.

TABLE 1

Published counts of breeding Kittiwakes and Common Guillemots on the Bempton and Flamborough cliffs, 1952 onwards.

Date	Kittiwakes	Common Guillemots	Source
1952	17,600 birds	7,150 birds	Brownsey and Peakall (1953)
1964	31,195 nests	12,950 birds	Williams and Kermode (1968)
1969	30,797 nests	12,570 birds	Seabird Colony Register, JNCC
1974		13,801 birds	Yorkshire Naturalists' Union Annual Ornithological Report
1978	100,000 pairs		Yorkshire Naturalists' Union Annual Ornithological Report
1979	83,000 pairs		Yorkshire Naturalists' Union Annual Ornithological Report
1985 1987	85,000 pairs	32,600 birds	Grimmett and Jones (1989)

Methods

Study area

On the cliffs of the seabird colony at Flamborough Headland, a total of 12 study plots were chosen. They were not selected at random (Walsh *et al.* 1995), but with a view to safety, convenience, visibility of the birds, and scatter of the plots over areas with relatively dense breeding populations. Each plot was observable in its entirety from a single easily accessible well-defined viewpoint and contained 100 to 2000 clearly visible Kittiwake nests. Half of the study plots were on Flamborough and half on Bempton Cliffs (Fig. 1). We estimate that these study plots comprise 10% of the whole colony, and assume that the birds in them are representative of the total breeding population.

Counting method

Counts were made from photographs of study plots taken between 11.00 and 16.00 hours on days in late May or June 1967, 1974 and 1994, using a Nikon camera with Nikkor telephoto lenses of variable focal length (50-300 mm) on black-and-white 35 mm film (Ilford: FP4). Photographs were printed on A4-sized paper. In 1967, nine study plots were photographed; in 1974, six were photographed; and in 1994 all 12 were photographed. Each plot was photographed in at least two different years, but only three plots were photographed in all three years. Between one and seven photographs were needed for each plot, as plots were of different sizes and viewpoints were at different distances from the cliff face. We refer to the resulting composite or single photograph of each plot as a photographic record. In composite photographic records, prints could be matched up so that no birds were counted twice. All counts were made by the second author, to avoid biases due to individual differences in counting methods (Harris & Lloyd 1977). The 12 study plots were recorded in 27 photographic records. On each, the numbers of apparently occupied Kittiwake nests and individual auks on breeding ledges were counted. Occupied

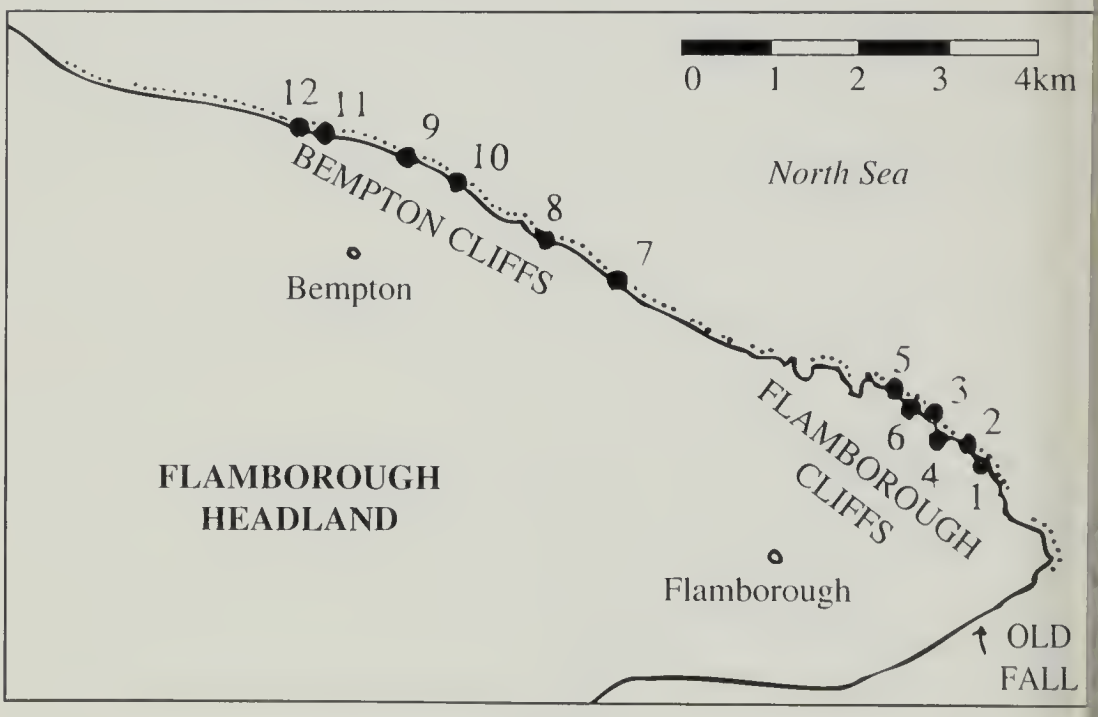

FIGURE 1
Map of Flamborough Headland. The extent of the seabird colony is indicated by small dots along the coastline. The 12 study plots are shown as large dots numbered 1-12: 1-6 on the Flamborough Cliffs and 7-12 on the Bempton Cliffs.

Kittiwake nests were circled on the photographic prints with a pen. Then, dots were made in the circles and simultaneously counted with a tally counter. Common Guillemots were counted by dotting them with a pen and pressing the button of the tally counter. Puffins *Fratercula arctica* could be differentiated from Common Guillemots on the photographs but a few Razorbills *Alca torda* were probably miscounted as Common Guillemots. We estimate that 90% of auks on the study plots were Common Guillemots, most Puffins and Razorbills on the headland being grouped together on cliff sections not chosen as study plots.

So that the repeatability of this counting method could be evaluated, three separate sets of prints were made of ten of the photographic records chosen from the total of 27 with the aid of a random number table (Zar 1984). Counts were made, at different times and without reference to previous totals, of birds on the three replicate records.

Well-feathered Kittiwake chicks per nest

Kittiwake breeding success was evaluated by noting nest contents in late June or early July, in six different years between 1970 and 1995. Binoculars were used and all apparently occupied nests on a clearly visible and easily demarcated section of cliff were counted. The sections of cliff thus counted were not the same each year. The total number of well-feathered chicks counted in any given section was divided by the total number of nests, including empty nests.

Statistical analysis

Log transformed counts of Kittiwake nests and Common Guillemots on a subset of ten photographic records, each printed and counted three times, were found to be repeatable in two-way ANOVAs with photographic records and replicate counts as factors ($F_{2,9} = 129.6$; $P<0.02$ for Kittiwake nests; $F_{2,9} = 131.0$; $P<0.02$ for Common Guillemots). In repeated counts of Common Guillemots on photographic records, the lowest counts were 39 to 100% of the highest counts; in repeated counts of Kittiwake nests, the lowest counts were 68 to 97% of the highest counts. The counting method was thus found to be accurate and repeatable. This means that the variation attributable to counting error was much smaller than the variation in counts between sites. Therefore, the first count of each photographic record was used in further analysis.

Counts of Kittiwake nests and Common Guillemots in 1967, 1974 and 1994 were compared using one-way ANOVA. All statistical analyses were carried out on Minitab for Windows version 10 (Ryan *et al.* 1985).

Results

Counts of Kittiwake nests

Figure 2 shows mean numbers of apparently occupied Kittiwake nests counted on the study plots in 1967, 1974 and 1994. The ANOVA on these counts of nests shows that mean numbers of nests counted did not differ significantly over the three years ($F_{2,24} = 0.27$: $P = 0.767$). The mean number of nests on study plots was 551 in 1967, 695 in 1974 and 580 in 1994.

Well-feathered Kittiwake chicks per nest

The total numbers of well-feathered Kittiwake chicks divided by the number of nests counted are shown in Table 2. In the 1970s the mean number of chicks per nest was 1.20: in 1994 and 1995 it was 1.18.

Counts of Common Guillemots

Figure 3 shows mean numbers of Common Guillemots counted on study plots in 1967, 1974 and 1994. The ANOVA on these counts shows that numbers changed significantly over the years ($F_{2,24} = 4.83$; $P<0.02$). Post-hoc Tukey pairwise comparisons showed a

PLATE 1
Kittiwakes and Common Guillemots in Petrel Hole (part of Study Plot 3), Flamborough Cliffs. Where the two species breed on the same cliff face, the Common Guillemots form discrete groups on the broader ledges.

significant difference between counts in 1967 and 1994 ($P<0.05$), but not between 1967 and 1974, or between 1974 and 1994. In 1994, the mean number of Common Guillemots on study plots was around 2.7 times that in 1967.

TABLE 2
Numbers of well-feathered Kittiwake chicks divided by the numbers of nests counted (= n). An asterisk indicates those counts which were made rather late in the year, when some chicks may have fledged.

Date	Location	Chicks/nest	n
16 July 1970*	Bempton	1.31	29
29 June 1974	Flamborough	1.58	45
30 June 1977	Bempton	0.69	265
1 July 1978	Bempton	1.23	171
15, 16 July 1994*	Bempton	1.40	139
13 July 1994*	Flamborough	1.41	138
3 July 1995	Bempton	0.88	52
4 July 1995	Flamborough	1.03	345

PLATE 2
The Bempton Cliffs seen from the Flamborough Cliffs. Staple Neuk (or Newk), nowadays crowded with breeding Northern Gannets, is visible on the far right.

Discussion

Counts of Kittiwake nests

The counts of apparently occupied Kittiwake nests on the study plots show that numbers did not differ significantly between the years 1967, 1974 and 1994. The geographical extent of the colony was not seen to change during this period. In 1973-1975 Kittiwakes did begin to colonise the south coast of the headland; on 9 June 1974 there were 40 occupied nests near Old Fall (Henry Bunce, *pers. comm.*: see Fig. 1). This colonisation attempt was abandoned shortly afterwards, and no breeding Kittiwakes were found during a search of the headland's southern cliffs in 1995.

In the only available counts of all the breeding seabirds of the headland, made in 1952, 1964, 1969, 1974-1979 and 1985-1987, Kittiwake numbers totalled 31,195 pairs in 1964, 30,797 pairs in 1969, and 83,000 pairs in 1979 (Table 1). Coulson (1983) accepted these figures, though admitting the difficulty of censussing this large colony, and concluded, mainly because of this apparent doubling or tripling of the size of the Flamborough Headland colony, that in the decade 1969-1979 the Kittiwake population on the east coast of England was still increasing. Elsewhere in Britain, Coulson recorded a general halt to the previous expansion of the Kittiwake population and even declining populations in some areas (Coulson 1983).

Our evidence suggests, contrary to the conclusions drawn from these counts, that there has been no substantial increase in Kittiwake numbers on the Flamborough Headland since 1967, and that the published counts cannot be relied on. Full details of the methods used in

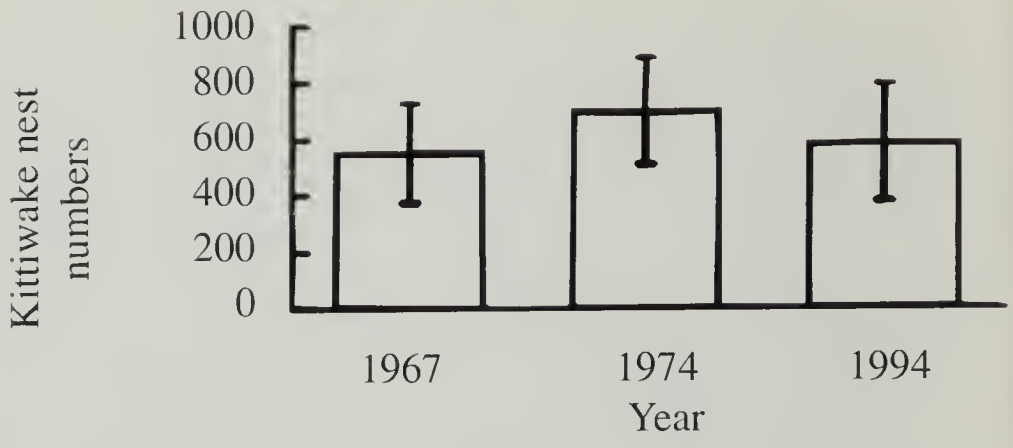

FIGURE 2
Mean numbers of apparently occupied Kittiwake nests counted on study plots in 1967, 1974 and 1994. The bars indicate standard deviations.

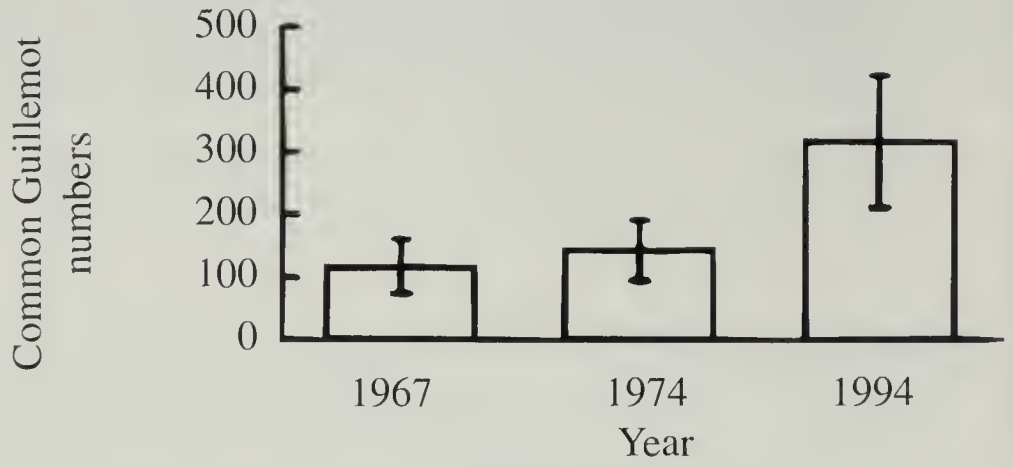

FIGURE 3
Mean numbers of Common Guillemots counted on study plots in 1967, 1974 and 1994. The bars indicate standard deviations.

these counts have not been published, but in the 1969 count a single observer was responsible for counting all the birds on the Bempton Cliffs on one day, and all those on the Flamborough Cliffs on another day (Seabird Colony Register, Joint Nature Conservation Committee). This seems to be an impossible feat. The 1978 and 1979 'counts' were clearly estimates only (Yorkshire Naturalists' Union Ornithological Report for 1979).

Kittiwake chicks per nest

Our figures for numbers of well-feathered chicks per Kittiwake nest (Table 2) are similar to the published mean value of 1.19 for Kittiwakes at Bempton in 1986-1991 (Walsh *et al.* 1994). There appears to have been little change in breeding success in the years 1970-1994.

PLATE 3
Part of Study Plot 5, Queen Rock Bay, Flamborough Cliffs north side. On an enlargement from this photograph taken on 27 June 1994, 347 apparently occupied nests of Kittiwakes and five Common Guillemots were counted.

Counts of Common Guillemots

The significant increase in Common Guillemot numbers on our study plots on the Flamborough Headland (Fig. 3) occurred at a time when their numbers were increasing elsewhere, for example in the Farne Islands (Lloyd *et al.* 1991). It is possible that, on the Flamborough Headland, the increase in numbers was partly due to the cessation of egging in 1954 after a centuries-long annual take which had varied from 30,000 eggs in the late 19th century to 10,000 eggs in the 1930s. Belopol'skii (1961) describes how systematic egg-gathering on Novaya Zemlya in 1923-1947 depressed the Brünnich's Guillemot *Uria lomvia* population by eight- or ten-fold, while allowing the Kittiwake population, which was not harvested, to increase from 0 in 1923 to 22,500 pairs in 1947. The same thing may have happened on the Flamborough Headland where, in the 1920s and 1930s, the Common Guillemot had ceased to be the most abundant breeding seabird and had been replaced in that role by the Kittiwake.

PLATE 4

Study Plot 9, looking west towards Bartlett Nab from Grand Stand, Bempton Cliffs. On an enlargement from this photograph taken on 28 June 1994, 493 apparently occupied nests of Kittiwakes and 241 Common Guillemots were counted. The lowest section of the cliff visible here did not form part of the study plot.

Conclusions

By counting birds or nests on photographs of selected study plots, we have shown that in 1967-1994, Kittiwake numbers on the Flamborough Headland did not change substantially, while Common Guillemot numbers increased by a factor of three. We have also shown that the published counts of these birds are not necessarily reliable. On the other hand, we have not been able to say anything about the total breeding population of either species. Indeed, the Northern Gannet *Morus bassanus* apart, nothing certain is known about the breeding numbers of any headland seabird species. However, it seems likely that a much more extensive programme of counting from photographs covering all visible cliff faces could yield valuable results.

Acknowledgments

We thank Henry O. Bunce, Trevor Charlton, Dr John C. Coulson, David J. Jennings, Margaret Vaughan and Dr Dean A. Waters for commenting on this paper.

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BOOK REVIEW

The Ecology of Woodland Creation edited by **Richard Ferris-Kaan**. Pp. 244, including 44 figures, 27 tables & 19 b/w plates. John Wiley, Chichester. 1995. £45.00 hardback.

This book springs from the British Ecological Society's Forest Ecology Group Symposium "Ecological Aspects of the Creation of New Broadleaved Woodland". This is a timely volume as there is currently much encouragement for establishing new native woodlands, supported by various native woodland incentive policies and grants. Contributions are largely based on the results of several decades of research into ecological development of post-war new woodlands, which has deepened understanding of what to expect and how and where best to proceed, and what value in terms of ecological benefit the end results may or may not achieve.

There are 14 chapters by various authors, covering different aspects of woodland creation. A concise yet detailed overview by G. F. Peterken is followed by chapters on soils, woodland composition, field layer plants, invertebrates, small mammals, birds and landscape features, as well as the practical aspects of natural regeneration versus planting, and problems associated with herbivore attack.

Several authors emphasize that although there is a great incentive now to create new woodlands, this should not be at the expense of existing, species-rich habitats; for example, planting or encouraging reversion to scrub of herb-rich pastures, wetlands and heathlands should be avoided. Even sites that are considered derelict wastelands may support unusual communities of plants and invertebrates. Key, in his chapter on invertebrates and new woodlands, states that in some cases, the fauna of existing value at such sites may be eliminated and replaced with a fauna of lesser interest. An overall net benefit for wildlife is most likely to occur with a planned expansion of existing woodland, or at least to ensure viable links between scattered, isolated small woods, where gradual migration of woodland species from a ready source will lead to an overall increase in populations of woodland

fauna and flora. This is especially the case if increase is by natural regeneration. Small, isolated woodlands have little chance to develop diverse woodland communities.

It is emphasised throughout that there must be a clear understanding of the objectives for creating new woodland and establishing clear long-term management, and several examples are given. Most authors warn that new woodlands are vulnerable to a host of problems at the early stages of establishment, and will take a very long time to look like woodlands, let alone develop the desired ecological diversity. There is a very useful chapter on the planning and designing of community woodlands. Tree planting and new woodlands herald a new appreciation of our natural environment and recognition of the need of people to enjoy the experience of walking in woodlands. Introduction of plants and manipulation of field layer vegetation experiments to create an attractive woodland ground flora in three urban plantations is described in detail by the Wolverhampton team.

The two chapters on soil restoration and ecology, and soil biotic communities are particularly instructive. There is good, practical advice based on much research for planting trees on land disturbed by mineral extraction, industrial development or dereliction and on ex-agricultural land, often prime sites for landscape improvement and seen as potential for new woodlands.

Although the various ecological formulae are comprehensively covered, few authors mention the financial aspects, such as the grants and woodland schemes that may be applicable to particular schemes; perhaps this is such a minefield of complexity that it is beyond the scope of this book.

One major omission, which is fairly common to many books on ecology and habitat creation, is any mention of crytogams, the fungi, lichens, bryophytes and ferns. The role of mycorrhizal fungi is fairly well covered in the two chapters on soils, but the ecological importance of other cryptogams is completely neglected. However, the excellent chapter by Key on invertebrates could equally apply to cryptogams, by substituting the word "cryptogams" for "invertebrates". Key also stresses that in the enthusiasm to create new woodlands, it is important not to overlook the significance of old woodlands. The wealth of ecological biodiversity associated with ancient woodlands can never be successfully replicated. He uses as example the parks established in the 17th and 18th centuries which still appear not to have developed the rich invertebrate faunas found in parks of medieval origin. The same, incidentally, can be said of the cryptogamic floras.

There is a fairly comprehensive review of different methods of seed sowing and comparison with planting from nursery-grown stock. A sensible ethical code of practice is mentioned, such as avoiding the planting of rarities which have a distinct, localised distribution pattern.

One of the biggest problems encountered in establishing new woodlands is herbivore damage. Present methods of control are described, but they have limitations, and are often very expensive, sometimes almost doubling the cost of establishing new woodlands. Control in urban woodlands may conflict with the perceived ideas of the general public, who often enjoy seeing rabbits, deer and squirrels, and regard them as part of the woodland scene, without appreciation of the damage and destruction they cause.

The scope and quality of this book makes it an invaluable source of reference for all professionals or students involved in ecology and land-use planning where woodlands are involved.

AMC

A 1994 PINE MARTEN *MARTES MARTES* (L.) RECORD FOR LANCASHIRE, INCLUDING A PRELIMINARY GENETIC ANALYSIS

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Introduction

Heavy persecution during the nineteenth century eliminated pine martens from much of lowland Britain until they were confined to the West Highlands of Scotland and smaller, isolated populations in northern England and Wales (Langley & Yalden, 1977; Tapper, 1992). Although recent surveys have confirmed the continued survival of martens in relict populations south of the species' main range in Scotland, concern has grown in recent years over their status. Disagreement exists over whether they are viable populations, or a few wandering individuals from a population on the verge of extinction (Bright and Harris, 1994; McDonald *et al.*, 1994; Strachan *et al.*, 1996; Velander, 1983).

Since pine martens in England and Wales live at low densities, they are difficult to monitor in the absence of clear evidence in the form of abundant fresh droppings (known as scats) and road casualties (Strachan *et al.*, 1996). Whilst some biologists agree that in this situation reliable monitoring can be achieved by indirect methods (for example, through the careful evaluation of reported sightings), the inevitably rare occurrence of a corpse may provide irrefutable evidence of the survival of a population when indirect evidence is disputed. Therefore, a 1993 pine marten skull recovered and described by Jefferies and Critchley (1994) suggested the continued existence of a North Yorkshire population regarded by some as extinct (Bright & Harris, 1994). Additionally, a relatively fresh, intact corpse provides opportunities to examine the pelage, biometrics and genetic characteristics of the individual. These are important considerations in the light of the possible existence of non-native martens in some parts of Britain, such as the beech marten *Martes foina*, American marten *M. americana*, and *Martes martes* of continental stock (Strachan *et al.*, 1996).

Methods

As part of an exercise, designed to monitor the status of relict pine marten populations in the 1990s in England and Wales, an appeal for records was published widely by The Vincent Wildlife Trust. People reporting sightings of live or dead martens were questioned closely according to a standard protocol in order to evaluate each report and assign it a confidence score.

The appeal for records generated a large volume of reported sightings of martens from discrete areas of England and Wales. Most reports were of live animals, but eight referred to corpses of road casualties discovered in the 1990s; only one of these, the subject of this paper, was collected and preserved in some form.

DNA was extracted from a skin tissue scraping of this individual, using standard methods. A fragment of the mitochondrial DNA (D loop) was compared against an identical fragment isolated from 3 Scottish and 1 Irish pine martens. Samples were amplified using the polymerase chain reaction (PCR; Mullis *et al.*, 1986), and the relative mobility of fragments compared on a polyacrylamide SSCP gel (Sheffield *et al.*, 1993).

Results

The record

In response to publicity in the January 1996 edition of the journal *BBC Wildlife* (Anon

1996), a photograph of a reported pine marten was sent to The Vincent Wildlife Trust by a reader living in Lancashire. The animal had been found dead beside the A581 road in June 1994. This site is on the southern edge of an area of mature parkland in the valley of the River Yarrow on the east side of the M6 motorway at Euxton, near Chorley, Lancashire (grid reference SD5418). It lies between the sparsely populated moors north of Manchester and the coastal lowlands of West Lancashire. The landscape is thinly wooded and dominated by livestock farming and urban fringe habitats. The human population of the surrounding area is relatively high, with the towns of Preston and Blackburn some 10 km to the north, and Skelmersdale, Wigan and Bolton some 15 km to the south. However, only 5 km to the east, beyond the M61 motorway, lies a large area of sparsely populated, upland country which links with the southern Pennines. Access to this area could be provided by the "wildlife corridor" of the River Yarrow.

When recovered, the corpse appeared fresh-killed and relatively undamaged. Its finder assumed it to be a road casualty, and took it to a local taxidermist who confirmed it as a pine marten and preserved and mounted it (N.B. it was mounted in an unlikely pose, with its tail curved above its back – see Plate 1.). This taxidermist died shortly afterwards, so could not be interviewed about the corpse and the whereabouts of any skeletal remains. The mounted corpse was examined by JDSB in February 1996, and a tissue sample was removed for genetic analysis.

Pelage and dimensions

Unfortunately, as the specimen had been mounted only approximate biometric measurements could be recorded. Also, possible expansion or contraction of the skin during taxidermy meant that any measurements may not be wholly reliable. Nevertheless, the total length was measured as 79 cm, with a head and body length of 50.5 cm and a tail of 28.5 cm. The head and body length lay within the range given in Velander (1991) for Irish and Scottish pine martens, but the tail was slightly longer. On the basis of its size and cranial width, the animal was probably a male.

PLATE 1

The mounted Euxton (Lancashire) pine marten, recovered as a road casualty in June 1994.

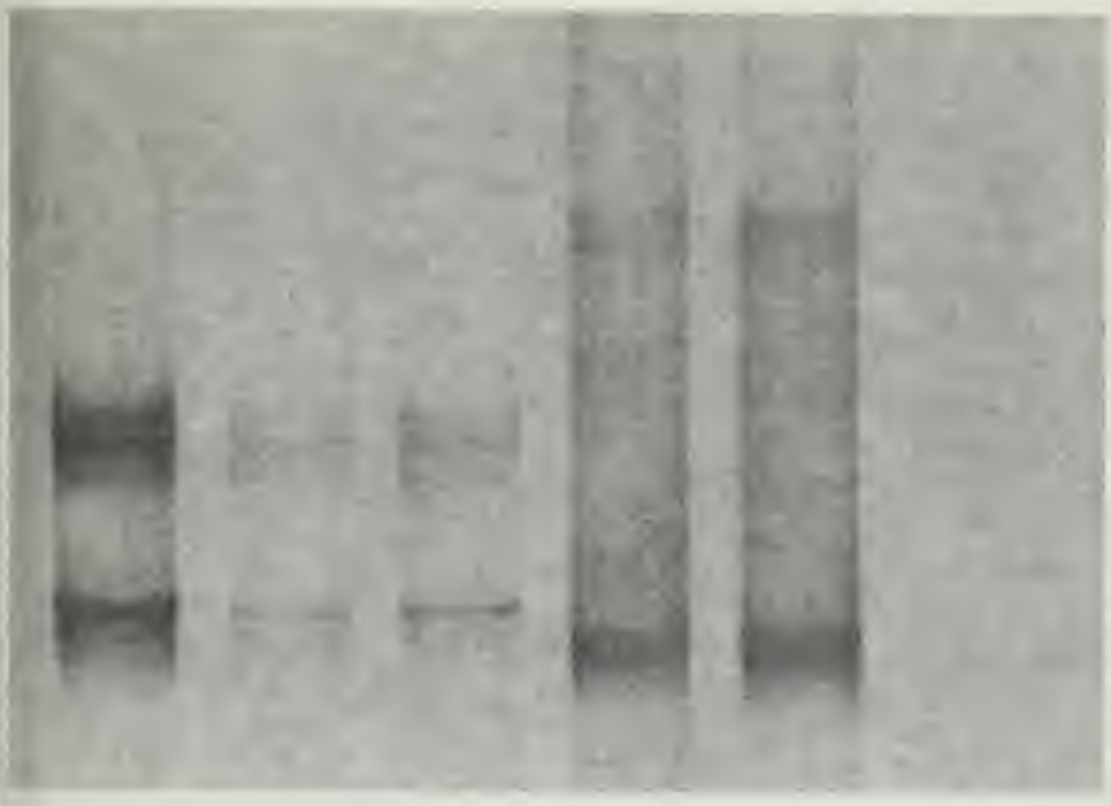

PLATE 2

SSCP gel of amplified mitochondrial D loop fragments from five martens. Lanes 1 to 3 are samples extracted from Scottish pine martens; lane 4 is from the Euxton individual, and lane 5 is an individual from the Co. Laois, Ireland. The banding pattern separates lanes 1, 2, and 3 from lanes 4 and 5, implying that the mitochondrial DNA from the English/Irish specimens is more similar and that they are more closely related.

The fur on the marten's body and tail was a medium brown colour, with darker brown fur on the legs, feet and head. A large creamy-white 'bib' approximately 8 cm across was present on the animal's throat and chest. This pale bib extended down between and onto the upper, inner parts of the animal' s forelimbs, where it was broken up among the brown fur.

Genetic Analysis

The mitochondrial DNA fragment from the Euxton pine marten was more similar to that of an individual from Ireland than from three Scottish individuals (Plate 2, and unpublished DNA sequence data, A. Davison). This implies that the Euxton pine marten is more closely related to the Irish pine marten. However, great care must be taken in interpreting the result at this stage, and many more samples from all three countries would be required for a full analysis.

Discussion

The discovery of a rare animal in a part of Britain where the species is thought by some to be extinct leads inevitably to questions about its likely origin. The possibility that it was an exotic such as *Martes foina* or *M. americana* is effectively ruled out by the combined evidence of pelage characteristics and DNA analysis (A. Davison, unpublished DNA sequence data; Carr & Hicks, in press), which together confirm that the specimen was *Martes martes*. However, the occurrence of this animal as an apparent road casualty in

urban fringe habitat in south Lancashire is more difficult to explain. Below we discuss three possible origins for the specimen.

Release or escape from captivity

Strachan *et al.* (1996) recorded a number of instances of the accidental or deliberate release of martens into the wild in Britain during the late nineteenth and twentieth centuries. Many of these were exotic species or pine martens of non-indigenous stock, farmed for their fur. Others were imported to add to private collections. For example, Howes (1985) describes the escape of a male pine marten following the importation of two pairs from Ireland which were kept at Duncombe Park in North Yorkshire in 1934.

Currently, relatively few pine martens are known to be kept in captivity in Britain: of the 21 animals, currently registered, 12 are of continental stock from the Czech Republic, 7 are of Scottish origin, and the remaining two are the products of captive Czech/Scottish matings (M. Fitzpatrick, *pers. comm*). The number and origin of unregistered martens kept in private collections is unknown, though it is thought likely either to reflect the composition of the registered stock described above, or to be dominated more heavily by animals from Scotland where the relative abundance of wild martens ensures the ready availability of animals to be taken (illegally) from the wild.

The genetic analysis of the Euxton marten suggests that it may not be of Scottish stock (a Czech origin cannot be ruled out, however), although more extensive sampling would be required to confirm this. The genetic similarity of the Lancashire animal to an Irish marten is intriguing, and may point to an historic link with earlier introductions from Ireland. However, in the absence of recent Czech, English and Welsh material for comparison no firm conclusions can really be drawn from this evidence. An equally likely explanation of the genetic result is that pine martens similar to the Lancashire/Irish type are present in Scotland, but we have not yet sampled from them.

Accidental transport from Scotland

It was suggested locally that the animal may have been inadvertently transported from the species' main stronghold in Scotland on a timber lorry (M. Ainscough, *pers. comm.*). This suggestion, made on the assumption that the animal was unlikely to have had a local origin, was prompted by the close proximity of the road casualty site to the M6 motorway (which links the area directly to southern Scotland), and the number of timber merchants in the Chorley/Leyland area likely to import material from Scotland. There are some instances of mammals being transported long distances in timber loads: for example a specimen of the Little Brown Bat *Myotis lucifugus* was accidentally imported to Britain alive in a ship carrying timber from North America in the 1970s (D. Jefferies, *pers. comm.*). However, it seems much less likely that an agile (and substantially larger) mammal such as a pine marten would either a) take refuge in or be loaded dead and unnoticed onto a timber load, or b) choose to remain on a moving lorry for any length of time. The genetic analysis of this animal does not suggest a Scottish origin, though again the same provisos apply as above.

Local wild-bred origin

Langley and Yalden (1977) listed Lancashire as one of only four English counties (alongside Yorkshire, Cumberland and Westmorland, all of which have since been subject to administrative reorganisation) in England from which the pine marten never became extinct during and after its nineteenth century decline. A substantial body of records from 1800 to the late 1980s, analysed by Strachan *et al.* (1996), led them to identify four separate marten populations surviving in the north of England into the late 1900s. One of these, identified by Strachan *et al.* (1996), as population C, is based on Cumbria/Lancashire, with an apparent stronghold in Lakeland and a southern "tail" extending down through northern Lancashire into the Dales of western North Yorkshire. However, the 1994 road casualty occurred at a site in the south of Lancashire in an area

which has generated no pine marten records since at least 1800.

This begs the question as to whether the animal may have been a wanderer from the current core of Strachan *et al.* (1996) population C some 80 km to the north, or from the core of their population D – based on West and South Yorkshire/Derbyshire – which lies some 70 km to the east. Travel from either of these areas would be well within the capability of pine martens, which are renowned for their long-distance movements (Hurrell, 1968). The latter area is linked to the road casualty site by a strip of mainly undeveloped open moorland-dominated country north of Manchester (although it is crossed by at least two motorways and six A class roads). In contrast, population C is separated from the road casualty site by urban areas such as Preston, Blackburn, Accrington and Burnley. However, there are some breaks in this chain of urban habitat, such as that between Preston and Blackburn, which includes moorland and strips of well-wooded "wildlife corridor" which might provide a migration route for martens. Furthermore, potential marten habitat is represented in the sparsely populated and little-visited Forest of Bowland, which lies to the north of Preston and Blackburn and less than 30 km north of the road casualty site. Records of martens from both the Cumbria/Lancashire and West and South Yorkshire/Derbyshire populations have apparently been declining in number since the period 1960-1976 according to Strachan *et al.* (1996), leading them to cast doubts on their long-term viability. However, recent appeals for information by The Vincent Wildlife Trust have generated credible records which suggest that martens still occur in the north-west of England well within 100 km of the road casualty site. For example, in June 1991 a pine marten was seen by an English Nature officer at Blubberhouses, North Yorkshire (SE1755), where it was apparently hunting grey squirrels in a stand of Scots pines; in April 1994 a birdwatcher observed a pine marten at Howden Clough, South Yorkshire (SK1793), and in 1995 a walker observed a marten within 2 km of this location; in April 1996 a volunteer National Trust warden described an animal thought to be a pine marten crossing a road at night between Shelley and Elmley Moor (SE2111 – in the heart of "population D"); in 1993 a birdwatcher saw a pine marten at Bradfield, South Yorkshire (SK2492), and other sightings have been reported from this locality. These are but a sample of the recent reports received from this part of northern England.

The Lancashire specimen, together with the recent sightings of live animals from various localities, supports the view that pine martens still occur in parts of the north-west of England, albeit in low numbers. The origins of the Lancashire animal cannot be deduced with certainty at present. However, the available evidence suggests that a wild origin for the specimen is not unlikely, particularly in view of the pine marten's capacity to travel great distances from known population centres. Bearing this in mind, and taking account of the four surviving populations identified by Strachan *et al.* (1996), it should not be viewed as surprising if martens are recorded occasionally in unusual places over much of northern England. Above all, it remains very important that all future reports of martens in northern England are treated seriously and evaluated carefully.

We are grateful to Michael Woods for the publicity which led to this record, and to Mrs Ellen Davies for collecting and preserving the animal and for contacting The Vincent Wildlife Trust. We thank Andrew Kitchener, Paddy Sleeman, and A. Jim Fox for access to other marten material. Don Jefferies gave valuable advice and made helpful comments on a draft of this paper.

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BOOK REVIEW

Lichen Biology edited by **Thomas H. Nash**. Pp. xii + 303, including numerous b/w plates, line drawings & tables. 1996. Cambridge University Press, Cambridge. £50.00 hardback, £16.95 paperback.

Although a welcome addition to our knowledge of lichens, containing some hitherto unpublished and unsynthesised material, the style, and to a large extent the content of this book, militates against its main purpose, namely to replace Mason Hale's admirable *The Biology of Lichens* which passed through three editions (1967, 1974 & 1983) and was for so many their introductory reading on the subject.

Nash's edited work does not fully serve as an introductory text, but may have some value as a student textbook. He has made an effort to unify the style and approach of the different authors and produced a single comprehensive bibliography of 639 titles and an extensive index, but the inherent difficulties which arise from multi-authored volumes are still apparent.

Despite these misgivings, this book has much to commend it, and those already versed in the subject will still find much to interest them. Honeggar's chapter superbly portrays mycobionts and morphogenesis in photographs, line drawings, flow-diagrams and tables; Nash ably contributes three chapters on physiological processes, which include the only significant ecological input to the volume; Fahselt provides state-of-the-art information on molecular genetics, intraspecific variation, gene flow and ecotypes; authoritative chapters are also provided on photobionts (Friedl & Budel), morphology and anatomy (Budel & Scheidegger), biochemistry (Elix), biogeography (Galloway), systematics and classification (Tehler), and lichens as air pollution indicators (Gries).

Unfortunately numerous citation and spelling errors have been detected throughout the text. No doubt such an otherwise excellently produced work with a good market potential will be revised, at which time these errors and the above deficiencies in content and approach can be made good.

MRDS

TERRESTRIAL MOLLUSCAN FAUNA OF WILTON WOOD, NORTH-EAST YORKSHIRE

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Introduction

Wilton Wood, in north-east Yorkshire (VC62; GR45/5919), has long been known for the diversity of its flora and fauna. The wood is owned by ICI plc and is about one km south of the ICI Wilton industrial site (Fig. 1), on the southern side of the River Tees estuary. It is a semi-natural broadleaved woodland, apparently ancient (Cooke, 1987), the principal species being ash, oak, sycamore, lime and beech. Early records of its terrestrial mollusean fauna were published by Ashford (1879), Hudson (1886) and Taylor (1894-1921). In addition, Hawell (1899) compiled a list of the molluses of the Cleveland district which contains many records for "Wilton"; it is very likely that these refer to species recorded in the wood rather than elsewhere in the parish. There do not seem to be any later published data on the wood and neither the Biological Records Centre nor the Yorkshire Conchological Society have any records for this period (M. P. Kerney, Natural History

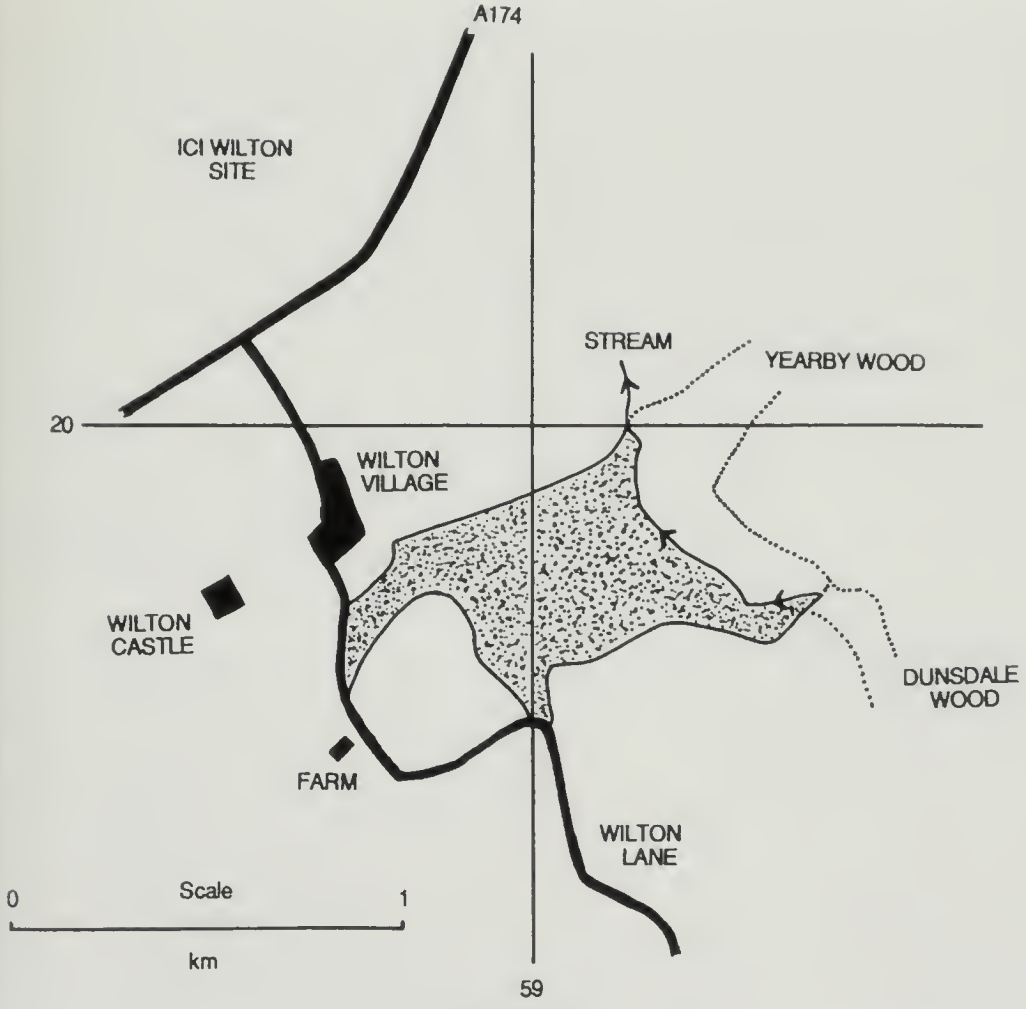

FIGURE 1
Wilton Wood (stippled), showing boundaries adopted for the present study. National grid lines at one km intervals are indicated.

Museum, London and A. Norris, Leeds City Museum respectively, *pers. comm.*).

As part of an ongoing study of the Mollusca of woodlands in north-east Yorkshire (Wardhaugh, 1996 & in press), Wilton Wood was surveyed extensively in 1985-86 and again in 1994 in order to look for any significant changes during the intervening period. The purpose of this article is to present the results of these two surveys and to make comparisons both between them and with the earlier studies cited above.

Method

Details of the survey method have been provided elsewhere (Wardhaugh, 1996). In outline, recording was effected by a combination of searching on site and hand sorting of leaf litter and ground layer vegetation samples. A number of visits were made at different times of year. During the first survey in 1985-86, recording was considered to be complete when no new species were found after one hour's additional searching. Since a record was kept of the duration of visits and number of litter and vegetation samples collected, it was possible to carry out a further survey in 1994 with a similar time input, in order to achieve broadly comparable results.

In an attempt to supplement previously published data, the terrestrial mollusc collection of the Dorman Museum, Middlesbrough was inspected.

Results

The records of Ashford (1879), Hudson (1886), Taylor (1894-1921) and Hawell (1899) together with those from the two recent surveys are provided in Table 1. Nomenclature is largely that of Kerney and Cameron (1979), earlier scientific names being revised as appropriate. The few relevant specimens held by the Dorman Museum are listed in Table 2.

In total, 39 species were recorded during the 1985-86 and 1994 surveys. Four species found in 1985-86 were not relocated during 1994, these being the very small snail *Punctum pygmaeum* and the slugs *Arion fasciatus, A. silvaticus and Deroceras laeve*. The 1994 survey added three new species: the synanthropic slug *Deroceras caruanae* was found near to Wilton Lane (the minor road at the western end of the wood) and the snail *Cepaea hortensis* by a stream marking the north-eastern boundary (Fig. 1). The third new species was the small, subterranean snail *Vitrea contracta*.

TABLE 1
Mollusca of Wilton Wood, north-east Yorkshire.

Species	Ashford 1879	Hudson 1886	Taylor 1894-1921	Hawell 1899	Wardhaugh 1985-86	Wardhaugh 1994
Carychium minimum agg.	*			*		
Carychium minimum seg.					*	*
Carychium tridentatum					*	*
Cochlicopa lubrica	*			*	*	*
Columela edentula	*				*	*
Vertigo substriata					*	*
Vertigo pygmaea	*					
Leiostyla anglica					*	*
Lauria cylindracea					*	*
Acanthinula aculeata	*			*	*	*
Spermodea lamellata	*				*	*
Punctum pygmaeum					*	
Discus rotundatus	*				*	*
Arion ater agg.			*		*	*
Arion subfuscus			*		*	*
Arion circumscriptus agg.			*			

Arion circumscriptus seg.					*	*
Arion silvaticus					*	
Arion fasciatus					*	
Arion hortensis agg.			*			
Arion distinctus					*	*
Arion intermedius					*	*
Vitrina pellucida				*	*	*
Vitrea crystallina agg.	*			*		
Vitrea crystallina seg.					*	*
Vitrea contracta						*
Nesovitrea hammonis	*		*	*	*	*
Aegopinella pura	*			*	*	*
Aegopinella nitidula				*	*	*
Oxychilus cellarius				*	*	*
Oxychilus alliarius	*			*	*	*
Oxychilus helveticus			*	*		
Limax maximus		*	*	**	*	*
Limax cinereoniger					*	*
Limax marginatus					*	*
Deroceras laeve			*		*	
Deroceras reticulatum					*	*
Deroceras caruane						*
Euconulus fulvus agg.	*			*		
Euconulus alderi					*	*
Euconulus fulvus seg.					*	*
Clausilia bidentata				*	*	*
Balea perversa				**		
Zenobiella subrufescens	*			*		
Aslifordia granulata				*		
Trichia hispida				*	*	*
Arianta arbustorum			*		*	*
Cepaea nemoralis				*	*	*
Cepaea hortensis						*

For Hawell (1899) * = Wilton & ** = Wilton Wood;
records for all other authors refer specifically to Wilton Wood;
nomenclature adjusted to that of Kerney and Cameron (1979)

TABLE 2
Terrestrial molluscs from Wilton Wood held by the Dorman Museum, Middlesbrough.

Species	Collector	Date
Spermodea lamellata	B. Hudson	1882
Cochlicopa lubrica	C. E. Thornton	14.11.1973
Discus rotundatus	"	"
Vitrina pellucida	"	"
Vitrea crystallina	"	"
Euconulus fulvus seg.	"	"
Arianta arbustorum	"	"

Identification of all specimens confirmed by the present author.

Discussion

Differences between the lists of species recorded in 1985-86 and 1994 are minimal and it is

probable that the four species noted only during the first survey could be refound given sufficient time and effort during optimum season and weather conditions. Consequently, the overall impression is that the species of terrestrial mollusc occurring in the wood have not changed to any appreciable extent since the 1985-86 survey. This is not surprising since the wood has not been subject to any significant alteration during the intervening time and subjectively, it appears to be very little changed. The most notable species recorded were *Vertigo substriata, Leiostyla anglica, Spermodea lamellata* and *Limax cinereoniger*, all of which are scarce and declining nationally (Kerney, 1976; Kerney & Cameron, 1979). In the context of possible changes in the molluscan fauna of the wood, it is perhaps significant that all four were recorded during both surveys. Kerney & Stubbs (1980) consider these species to be characteristic of ancient woodland, a view which concurs with other evidence regarding Wilton Wood. Thus Cooke (1987) lists the wood as ancient, largely on cartographic evidence (ancient being defined as in existence since at least 1600 AD). Also, several flowering plants considered to be indicative of ancient status (Peterken, 1981) are present, including Wood Anemone (*Anemone nemorosa*), Wood-sorrel (*Oxalis acetosella*), Yellow Pimpernel (*Lysimachia nemorum*), Woodruff (*Galium odoratum*), Pendulous Sedge (*Carex pendula*), Woodrush (*Luzula sylvatica*) and Wood Millet (*Milium effusum*) (Wardhaugh, in press).

Wilton Wood shows few signs of significant disturbance in the past; for example, it does not appear to have been extensively or regularly coppiced. Of its terrestrial molluscs, *S. lamellata* and *L. cinereoniger* in particular are considered to require undisturbed conditions (Kerney, 1966; Kerney & Cameron, 1979), lack of disturbance having been regarded as significant for woodland molluscs in a number of previous studies (e.g. Boycott, 1934).

When compared with the recent surveys, it is clear that the lists for the 19th century are incomplete, the authors evidently omitting known locations for common and widespread species (e.g. Taylor, 1894-1921). Nonetheless, some of the most notable species, including *V. substriata, L. anglica* and *L. cinereoniger,* do not appear in the early records either which is less easy to explain. However, the first two are small species and may have been overlooked, especially *V. substriata*.

Conversely, five species (*Vertigo pygmaea, Oxychilus helveticus, Balea perversa, Zenobiella subrufescens* and *Ashfordia granulata*) recorded during the earlier studies were not found in the 1985-86 or 1994 surveys. *A. granulata* was recorded as present in "Wilton" by Hawell (1899) but since it is scarce in north-east Yorkshire and associated with moist woodland, it seems very likely that this record does refer to Wilton Wood. *V. pygmaea* has been recorded in the wood only once, by Ashford (1879), who described it as being "found sparingly". It is a very small species which could have been overlooked during the recent surveys. However, it is unlikely that this is the case for the other four species, all of which are larger and more conspicuous. All of the 19th century recorders were experienced conchologists, most of the relevant records compiled by Taylor (1894-1921) being supplied by Baker Hudson and W. D. Roebuck. Consequently, misidentification by these earlier naturalists seems unlikely and the most probable reason for failure to find the five species in question is their extinction during the intervening period.

V. pygmaea, B. perversa and *Z. subrufescens* have all declined on a national scale this century, whilst *A. granulata* may have done so to some extent (Kerney, 1976; Kerney & Cameron, 1979). The reasons for this are not particularly clear although in the case of *B. perversa* atmospheric pollution may have been the cause (Holyoak, 1978). In north-east Yorkshire, *O. helveticus* is at the northern limit of its range (Kerney, 1976) so perhaps it too died out in Wilton Wood since the 19th century.

With 39 terrestrial mollusc species recorded during the two recent surveys, Wilton Wood is one of the two most species-rich of 17 woodlands investigated in north-east Yorkshire and in addition, it ranks first among these in a recently devised quality scoring system (Wardhaugh, in press). Its species total is higher than that reported for any of 128 woodlands in various other parts of Britain, the relevant studies being listed elsewhere

(Wardhaugh, 1996). Wilton Wood is thus of at least regional signifieanee with respect to its mollusean fauna. However, it has been argued that speeies diversity has at least three components (Putman, 1994). In addition to species richness and quality, relative population sizes of speeies should be considered. Consequently, it would be of value to have some quantitative data on at least the rarer mollusc species present. Of the four nationally scarce species discussed above, the subjective impression is that *L. cinereoniger* is quite widespread in moderately moist parts of the wood at seemingly low density. *L. anglica* is also fairly widely distributed. *S. lamellata* seems to be more restricted in its distribution, oecurring in moist beeeh litter by the stream forming the north-eastern boundary of the wood, whilst *V. substriata* is apparently scarce and restricted to bank-side vegetation such as *Carex pendula* in the same area.

ACKNOWLEDGMENTS

I would like to thank Mr J. K. Smith, formerly Senior Ecology Adviser of ICI plc., for arranging access to Wilton Wood, and Mr K. Sedman for providing access to the Mollusca collection of the Dorman Musum, Middlesbrough.

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REVIEW ARTICLE

Richard Spruce (1817-1893), Botanist and Explorer edited by **M. R. D. Seaward** and **S. M. D. FitzGerald**. Pp. vii + 359, including many figures, tables & b/w plates. Royal Botanic Gardens, Kew. 1996. £28.75 paperback (including postage from: Mail Order Dept., Royal Botanic Gardens, Kew, Surrey TW9 3AB).

When I received a copy of this brand new volume about a Yorkshire explorer of the nineteenth century who spent fifteen years of his life within the depths of the Amazonian forests and later the heights of the Andes, I was disturbed by the fact that I had never heard of Richard Spruce, Botanist and Explorer. I eagerly read Mark Seaward's "Introduction", followed by Richard Evans Schultes' chapter about "Richard Spruce the man". The more I read the more I realised that Richard Spruce was indeed a very special person.

The volume itself is a collection of papers read at the Annual Regional Meeting of the Linnaean Society of London, held at York on 20-22 September 1993, the occasion being a Commemorative Conference for Richard Spruce (1817-1893), Botanist and Explorer. Most of the papers were presented by botanists from North America, for it was from the United States in particular that the exploratory work of Richard Spruce was investigated and brought before the world. As Richard Evans Schultes states in his paper "Spruce deserves to be known both as a man and a scientist, for his research and discoveries have benefitted not only science but mankind in all corners of the earth. Yet though his achievements might be lauded in such widely separated countries as Brazil, Colombia, Ecuador, Venezuela, Ireland, Ceylon, Malaysia, Singapore, England, and France, his name, even in his native Yorkshire, goes unremembered beyond a limited circle of scientific or natural history enthusiasts".

Mark Seaward's "Introduction" draws attention to Alfred Russell Wallace, the evolutionist, who researched much of Spruce's life by editing the latter's note books in a work entitled *Notes of a botanist on the Amazon and Andes*. Wallace also added a 27-page biographical introduction to the notes. From it we learn that Richard, son of Richard Spruce, schoolmaster, was born at Ganthorpe near Castle Howard on 10 September 1817. Richard's education was greatly influenced by his father, who was responsible for him learning Latin, which later proved invaluable during his travels in producing formal descriptions of new species found in Brazil and adjacent countries. When Richard was not studying or assisting his father at school, he was collecting plants in his locality. A local inhabitant, George Stables, encouraged him with his recreation and had remarked that "amongst his favourite amusements was the making of lists of plants". Later, Spruce visited Wharfedale and Teesdale and listed a number of plants. Spruce visited Ireland and under the guidance of Thomas Taylor listed more plants in County Kerry.

Richard Spruce's career as schoolmaster ended in 1846 with the closure of York Collegiate School. His correspondents William Borrer, Sir William Hooker, and George Bentham advised him to visit the Pyrenees, since he had produced a number of lists and articles between 1841 and 1846. Spruce learned some conversational French before leaving the country in 1845, returning in April 1846 with a large collection of bryophytes (478 species). He then wrote a paper, "The Musci and Hepaticae of the Pyrenees", which appeared in the *Transactions and Proceedings* of the Botanical Society of Edinburgh (1850).

Richard Spruce's health was always a cause for concern, and yet at no time was it a greater problem than before his journey to the Pyrenees. In March 1845 there was an outbreak of scarlatina in his father's village of Welburn, where he was now teaching. Three of his stepsisters died from the disease, whilst Spruce's father had an attack of erysipelas. Spruce took over his father's duties at the school until he had recovered: he was then free to go to the Pyrenees.

Any prospective explorer with an interesting project will try to obtain the sponsorship of as many persons or corporations as possible. Finance is the important factor, but companies trading in food, clothes, scientific instuments, and the like are carefully listed. Spruce was

Richard Spruce, drawn by Elmer W. Smith from a photograph in the Gray Herbarium, Harvard University, taken before Spruce left for South America.

offered help with listing, collection and distribution at Kew, but he had to provide the capital himself. In short, he was to offer collections of species to museums, herbaria and individuals. It was a while before 20 subscribers were available. Undeterred, Spruce allowed Sir William Hooker to publish excerpts from his letters to enable botanists to follow his itinerary in South America, thus preparing the subscribers or potential ones of future arrivals at Kew of his collections. Spruce sent his specimens to Kew, enabling George Bentham to identify all the flowering plants to be distributed in sets.

Richard Spruce sailed from Liverpool on 7 June 1849 and arrived at Pará on 12 July. He wasted little time in starting his collections of plants. Soon he moved along the Amazon river to Santarèm, where he was able to examine the giant Victoria water-lilies. On his sea journey Spruce was accompanied by his assistant, Robert King, and Herbert Wallace, travelling to join his brother Alfred Russel Wallace: the two brothers were also scheduled to tour the Amazon Valley. Alfred Wallace was destined to edit Spruce's notes after his death.

Richard Spruce, Alfred Russel Wallace and Henry Walter Bates were dominant British explorers of biological species in Amazonia in the middle of the nineteenth century. All were self-taught biologists. Spruce specialized in botany, the others in zoology. They were unique in that they represented Britain, since other explorers were from Austria, Germany, Switzerland, France, and North America, mainly in commerce, banking, engineering and the like, who sometimes turned their hand to writing, but they rarely strayed beyond the Amazon basin.

In his paper Raymond Stotler concludes that "the impact of Spruce on liverwort study has been and still is substantial. Spruce's fifteen years of work in South America was more than that of a plant collector – it was the impassioned exploration of a scientist with the extraordinary ability to observe, record and synthesise". In his introduction, Mark Seaward

points out that though his ferns, mosses, lichens and fungi collected in South America were named by the experts of the day, his lifelong favourite group, the liverworts, were worked out by himself when he lived at Welburn and latterly at Coneysthorpe, where he was to spend the rest of his life. He collected nearly 500 himself, over 400 of which were new to science. His descriptions of over 700 species in his outstanding *Hepaticae Amazoniae et Andinae* make this still the greatest book on South American bryology. No botanist can afford not to consult Spruce's specimens and detailed notes.

Amongst the other important observations or collections by Spruce in South America can be quoted the following, as detailed by Gustave Romero, whose paper includes details of the 180 or more orchids *(Orchidaceae Spruceanae)* Spruce collected on his travels. In the Amazon and Orinocco areas 75 species were collected, 20 being new species. In the areas of Ecuador and Peru 105 species were collected, of which fourteen were new species. Palms had been collected by numerous European travellers before Spruce's journey to South America. Spruce did not attempt to collect the largest number of species, but added considerably to our knowledge of them. It appears he omitted many of the larger taxa because of the difficulties of drying and storage. From the Amazon region he described 47 new species from at least 62 collections, while from the Andes he only collected one new species from five collections. Spruce's work on palms was more important than was at first believed; his observations on their flowers, fruit and geographic distribution proved invaluable.

Warren Dean notes that Spruce was the first to describe the technique of rubber tapping and processing, although his colleagues went further in their notes about the distribution of rubber. The matter of distribution came later, after Spruce had left Amazonia: but it is certainly the best known product of the Brazilian forest. It was the chief export item from Belèm. Spruce is credited with discovering several new species of the rubber-yielding genus at a time when the demand for rubber was increasing throughout the world.

Towards the end of 1857 and during a busy season of collecting plants in the district of Tarapoto, Peru, Spruce received a request from the British Government to proceed to the *Cinchona* forests of Ecuador. He was requested to study the growing of *Cinchona* species and to try to obtain the best seeds and plants for shipment to India. All the world's quinine producing plants were in north western countries of South America: Bolivia, Colombia, Ecuador and Peru. According to William Drew, the export of *Cinchona* seeds or plants was prohibited from Peru and Bolivia. Spruce's occupation in the Andes for some years gave him precedence over the visiting agents from various powers. By agreement Spruce was able to collect 2500 fully-grown capsules of seed from trees at Limon and San Antonio in Ecuador, totalling 100,000 ripe seeds. During this period, Robert Cross, a Kew gardener, had been sent to assist Spruce with his manifold problems of growing and shipping the seeds. William Drew's chapter goes through the process of transporting the seeds to the port via the Andes with a civil war in progress. On 2 January 1861 the important cargo was shipped to Kew and on to India. Another cargo of seeds was shipped to Jamaica.

The volume also includes the biology of *manure*, the collection of cotton in Northern Peru, and even Brazil nuts receive a mention. The Director of the Royal Botanic Gardens, Sir Ghillean Prance, has a beautifully illustrated chapter on "A contemporary botanist in the footsteps of Richard Spruce". In addition to the Introduction and twenty papers by different authors, five chapters are dedicated to the Spruce collections at Kew, Manchester, Trinity College (Dublin), the Ulster Museum Herbarium (Belfast), and the Royal Botanic Garden, Edinburgh. Sylvia FitzGerald offers Archival resources on Richard Spruce, and Mark Seaward offers a Bibliography of Richard Spruce.

The editors are to be congratulated for their long and sometimes laborious task of arranging the York conference papers, along with many excellent photographs, in this volume. This attractive work should be read by scientists, especially the botanist, and in fact by all who wish to pay tribute to an outstanding scientist whose courage was beyond all bounds.

Kenneth Emsley

OBITUARY

JOHN ARMITAGE

(1900-1996)

John Armitage was well known and respected by all who knew him as an outstanding all-round naturalist, artist and photographer. Born in Oldham, Lancashire, on 16 September 1900 and educated at the Oldham School of Art, he became a designer and landscape painter. At the age of 14 he joined Oliver's of Manchester as a lithographer and illuminator; although his later work included illuminating manuscripts for the then Princess Elizabeth, the Duke of Edinburgh and the Shah of Persia, it was at this extraordinarily early age that he produced his best known illuminated work on behalf of the Conchological Society of Great Britain and Ireland. This illuminated address, now held as part of the Leeds City Museums Collections, was presented to John William Taylor on the occasion of his 70th birthday in recognition of outstanding work on British land and freshwater shells.

In 1924, he became a full-time naturalist, photographer and lecturer, joining Foyles Lecture Agency, London, which enabled him to travel throughout Europe and the Near East, and even to undertake a lecture tour in Jamaica. He also wrote for several local and national newspapers, including the *Daily Mirror* and the *Oldham Chronicle* (under the pseudonym "Moorcock"), and in later years the *Yorkshire Evening Post*. He moved from Oldham to Buxton, where he soon became a well-known figure in the dales and the moors of Derbyshire. His contributions to the study and understanding of the Snow Bunting on the Derbyshire Peaks are well known.

John spent his war-time military service as a photographer in the Royal Air Force, based for a period in Iceland. It was in the RAF that he first met a then young Michael ("Batty") Blackmore and taught him photography, a friendship which extended well beyond his military service and brought him into contact with a large number of natural history photographers, many of whom became close friends. He was awarded four service medals, a source of great pride to him.

John Armitage with his wife Mabel at Greenhow in 1985.

On 2 November 1953, he was appointed as Keeper of Biology at the Leeds City Museum under the then Director, Dr D. E. Owen, with John Wilfred Jackson, Ralph Chislett and Harry Britten acting as referees. John remained at the Museum until he retired on 16 September 1969, well after normal retirement age.

John was a Fellow and Judge of the Royal Photographic Society and a Fellow of the Royal Entomological Society, as well as being an active member of the British Ornithological Union, the Lancashire and Cheshire Fauna Committee, the Conchological Society of Great Britain and Ireland, the Yorkshire Naturalists' Union, the Leeds Birdwatchers' Club, the Leeds Naturalists' Club and Scientific Association, the Leeds Philatelic Society and many other organisations.

In his lifetime, he built up extensive collections of Lepidoptera and Mollusca; these, along with his field notebooks, diaries and most of his photographs, are now in the care of the Leeds City Museum.

He died in his sleep in a nursing home in Leeds on 5 August 1996. He leaves a wife, Mabel, two daughters, Helen and Heather, and four grandchildren. He also leaves many friends and acquaintances who will always remember him.

Adrian Norris

BOOK REVIEWS

Quaternary Insects and their Environments by **S. A. Elias**. Pp. 284, inc. 71 figs. Smithsonian Institute Press, Washington and London, 1994. £34.00.

This amazing book is a global overview of the literature concerned in the interpretation of Pleistocene subfossil arthropod assemblages, and is unquestionably of fundamental importance to all those concerned with Quaternary studies.

Inevitably, most studies have involved work on Coleoptera since these usually predominate in the deposits and our knowledge of them is well advanced, thanks to the extensive and sustained pioneer work of Dr G. Russell Coope, who provides the foreword to the book.

The coverage of the book is encyclopaedic! After the foreword, chapters are devoted to a history of Quaternary studies, methods of extraction of subfossils from sediments, aids to identification, a review of the value of insects in palaeoecology and palaeoclimatic research, and changes in insect zoogeography during the Quaternary. A global review of studies referred to in the literature follows, for which the references alone extend to 38 pages. There follows a resumé of areas of potentially valuable research, a glossary and an Appendix listing all taxa mentioned in the text.

A major hurdle faced initially was to dispossess sceptics of the notion that a subfossil insect must belong to an extinct taxon. Another was the widely held view that it was impossible to identify species accurately from fragments. Supporters of both of these positions were disarmed by the discovery that the Scarabaeid *Aphodius holdereri*, which is only known today from Tibet, was abundant in early post-glacial deposits in Britain. The discovery of a subfossil male specimen still containing the genitalia provided the vital confirmation. Further similarly incontestable evidence has come thick and fast regarding numerous other species, and indeed it has become apparent that the external morphology of insect species remained remarkably constant throughout the Pleistocene.

Today, doubts regarding the viability of subfossil studies on the above grounds have been dismissed and palaeoentomology has greatly assisted in interpreting post-glacial changes brought about by climatic and anthropogenic factors. However, several cautionary tales have inevitably surfaced through these researches, so that today interpretations are regarded as having greater validity if based upon species assemblages rather than single taxa. Even these can present some problems, as it is clear that certain assemblages, along

with their habitats, have disappeared in post-glacial times. In the Holarctic region endemism needs to be examined afresh, so great have been the movements of even the most sedentary taxa.

The stress throughout the book is on the climatic and gross ecological implications of the studies reviewed, greatly clarifying our understanding of the oscillating Arctic/subarctic boundary around the Holarctic throughout the Pleistocene. An unexpected discovery has been the often considerable time-lapse between insect and plant movements in response to climatic change, the insects exhibiting much greater sensitivity and hence allowing much greater precision in dating such changes. Neontologists dealing with modern insect faunas will of course be fully aware of this, as southern species move northwards in response perhaps to global warming.

The glossary is comprehensive, but has some surprising omissions. Thus, whilst the term Palaearctic is explained, Nearctic has no mention. The book is excellently illustrated throughout with high precision black and white photographs. The graphs and tables are also very well laid out, but site numbers on some of the maps lack clarity.

Whilst concerned mainly with Coleoptera, a small but very important proportion of the numerous case studies involve larval head-capsules of chironomid midges which have been shown to be of considerable value in limnological research.

Elias' book is written in a remarkably clear style which should present no difficulties in comprehension, irrespective of the reader's knowledge of Coleoptera. Whilst the reader will agree with Elias that an immense amount of work remains to be done, he will be astonished how widely Coope's lead has been taken up globally in this fascinating field of research. The present reviewer recalls the enormous scepticism which greeted Coope's first tentative steps in this field.

PS

Birds on the Spurn Peninsula by **Ralph Chislett** and **G. H. Ainsworth**, edited by **M. J. Densley**. Pp xlv and 216. Peregrine Books, Leeds. 1996. £14.95 hardback, post free from: Peregrine Books, 27 Hunger Hills Avenue, Horsforth, Leeds LS18 5JS.

Ralph Chislett published *Birds on the Spurn Peninsula* Part 1, in 1958. He was assisted by his colleague, G. H. Ainsworth, who was a mainstay in the day-to-day running of the Observatory from its inception in 1945. RC had always intended to publish Part 2, but had not achieved this before his death in 1964, and the assumption was that it would never appear. But for the diligence of Clive Varty, who recently had the good fortune to purchase the handwritten manuscript of Part 2, which had lain, unknown to any Yorkshire ornithologist, in the offices of Messrs. Wheldon and Wesley, this would have been the case and we would never have had the opportunity to see it. All credit must go to Varty and to Densley for bringing the two documents together in the present work.

The "modern" birder will, perhaps, not appreciate the nostalgia which only Chislett could impart in his down-to-earth and perceptive prose, but I would recommend its worth to anyone as a major contribution to the history of Yorkshire ornithology. A chapter devoted to "Gleanings from the logs" will be enjoyed by anyone who had early associations with Spurn. Reading some of the paragraphs, I can still smell the paraffin-laden air in the kitchen and the damp blankets in the Common Room: yes, we slept on the Common Room floor in those early days. I also well remember the bags of waste from the local farmers, which were used to bait the Heligoland traps and other smaller mechanical devices use to catch birds at the time, being fought over by rats in the store room. Most present-day bird ringers will be unfamiliar with such primitive methods. There were no mist nets then. All these experiences come out vividly in the writing and are a reminder of what birdwatching was all about in the 1950s. Things are very different now!

The new work includes chapters on Ralph Chislett and his Contemporaries; The Changing Face of Spurn; Cetacean Strandings at Spurn; Winds and Movements; Ringing Recoveries, and the main Systematic list, giving details of all birds recorded at the time with notes on their migrations. When viewed in context, this is a most valuable, and

certainly interesting, document. It is not a scientific reference book in the accepted sense, but stands on its own as the work of a dedicated man and his colleague, who had the foresight and energy to establish what was to become one of the premier bird observatories in the British Isles. It is on such seemingly primitive foundations and diligence that the chartered helicopters, long car journeys, Birdlines and pagers, all so seemingly necessary to the modern birdwatcher in order to see a rare bird, have evolved. Buy it and enjoy a good read.

JRM

Polygyny and Sexual Selection in Red-Winged Blackbirds by **W. A. Searcy** and **K. Yasukawa**. Pp. 312, including several figures and tables. Princeton University Press, New Jersey, 1995. £24.00 paperback.

This monograph on a species with which I am familiar in the Cattail marshes of North America is a very thorough and readable treatise. There are major chapters on: Parental Care; Territoriality; Female Reproductive Success; Female Choice of Breeding Situation; Polygyny; Sexual Selection in Progress; Adaptations for Sexual Selection: Polygyny, Sexual Selection and Female Red-Winged Blackbirds and Conclusions.

The complexities of what goes on in the depths of the marshes as males defend their territories and coerce females to join them, is spelt out very clearly and concisely. As with most specialised works of this kind, it will mainly be referred to by those academics pursuing similar aspects of behaviour, but the authors have presented the facts in such a clear way that anyone interested in bird behaviour can read it and learn much about this fascinating species.

JRM

The Moths and Butterflies of Great Britain and Ireland, Vol. 3 edited by **A. M. Emmet**. Pp. 452, 11 col. & 8 b/w plates. Harley Books, 1996. £75 hardback, £37 paperback.

This is the seventh volume to be published in the continuing series intended eventually to cover the whole of the British and Irish lepidoptera. The present volume treats the families Yponomeutidae, Epermeniidae, Schreckensteiniidae, Coleophoridae and Elachistidae together with the sole British representative of the Orthoteliinae (recently transferred to the Glyphipterigidae) and the Roeslerstammiidae, now regarded as a family in its own right in the superfamily Gracillarioidea which were otherwise covered in vol. 2 (1985).

A eminently readable and interesting chapter by David Agassiz entitled Invasions of Lepidoptera into the British Isles charts the progress of a number of invading colonists including, at the end of the last century, *Polychrisia moneta* (Fabr.) and more recently *Phyllonorycter leucographella* (Zell.) and *Lithophane leautieri* (Boisd.) all of which are now recorded from Yorkshire.

The systematic section continues the successful layout of previous volumes in the series but the decision to include illustrations of the male and female genitalia for all the species of Coleophoridae and Elachistidae is most welcome. Those of the Elachistidae are the work of Keith Bland and treatment of the male genitalia are at first sight unconventional, with the vinculum, uncus lobes, right valva and adeagus illustrated separately. However the method works well, allowing easy comparison of diagnostic features. The black and white plates consist of exquisite drawings of the cases constructed by the larvae of the family Coleophoridae at a magnification of x7. These larval cases are often much more readily identifiable than the moths themselves and the illustrator, Richard Lewington, who is also responsible for the colour plates, deserves the highest praise. Two of the colour plates (designated A & B) show details of the life history of *Coleophora pyrrhulipennella* Zell., the remainder (plates 9-17) illustrate the species treated, showing the right hand wings only but at a suitable magnification. They are of excellent clarity and a great improvement on

those in the earlier volumes dealing with the microlepidoptera.

The usual high standard of proof reading has resulted in the book being virtually error free, the only lapse noticed being that the name *Epermenia illiegrella* has persisted on map 83 despite the relevant text showing that this name has been misapplied in Britain to *E. falciformis* (Haw.). This series has improved with each succeeding volume; the present one, dealing as it does with some of the most troublesome families for the amateur lepidopterist, cannot be praised too highly and will be an indispensible addition to the library of any microlepidopterist.

HEB

Biodiversity and Landscapes: a Paradox of Humanity edited by **K. Chung Kim** and **R. D. Weaver**. Pp. xiii + 431, with numerous black and white figures and tables. Cambridge University Press. 1994, £50.00 hardback.

This book arises out of a conference held in 1990 in Pennsylvania, USA. It is not a set of conference proceedings, but the various chapters have been written to follow up the ideas discussed at the conference on biodiversity and landscapes. As such, it has slightly greater coherence than many books of edited proceedings, with cross-referencing between the chapters, but nonetheless the book is still essentially a collection of independent chapters on varied topics. On the whole it is a well-produced volume with only a relatively modest number of typographical errors, but interestingly this reviewer noticed most such errors in the final chapter written by the editors!

Since it is a collection of articles, the range of topics covered is wide, within the general framework of human attitudes towards, and influence on, biodiversity. Individual readers will no doubt have their own particular preferences, but I would like to pick out a few chapters for mention, to give a flavour of the topics covered and because I found them interesting. After an introductory chapter by the editors, the section on human values includes an interesting perspective (by Rolston) on a spiritual outlook on extinction and the value of species; in the section on human processes: a discussion of whether the Mayan civilisation caused environmental degradation (Sanders and Webster) indicates that enviromental problems are not only due to industrial technology; the section on management of biodiversity and landscapes includes an interesting perspective on restoring the eastern deciduous forest in the USA (Sauer); the section on socioeconomics includes a very readable chapter by Randall on ways of valuing biodiversity, besides an analysis of the potential to manage logging sustainably in the Amazon by Uhl *et al.*; strategies for conserving biodiversity are discussed in the next section, including a assessment by Bean of the status of political debate in the USA at that time; the final chapter is written by the editors, on the need for a shift in societal consensus to achieve preservation of biodiversity.

There are likely to be various thought-provoking items of interest from this collection, primarily for a readership of advanced-level undergraduates from any of the subject areas covered by the themes indicated above, and particularly environmental sciences. One irritant to this reviewer was the very strong American bias to the perspectives presented in a number of the chapters. However, it is a book to dip into and reflect on, helping to break down barriers between different subdisciplines, and as such should at least be on library shelves.

WHGH

Animals under Logs and Stones by **C. Philip Wheater** and **Helen J. Read**, with plates by **Miranda Gray**. Pp. 90, 4 colour plates. Naturalists' Handbook 22, Richmond Publishing Co. Slough. Price £8.95 laminated card cover, £15 hardback. (A separate 8 page concertina-guide, which includes the 4 colour plates and a simple 4 page tabular key to the common animals found under logs and stones, is available separately for £1.75.)

The handbook is made up of an introduction to the animal groups and their environment (26 pages), simple illustrated keys to the most common animals found in each of the

different groups (47 pages), 6 pages on collecting techniques and 5 pages of addresses and further reading, plus a 6 page index.

Since the acknowledgments list some of the leading authorities in the field, the handbook's content is, as one would expect, of a high standard. It is difficult to assess, however, for whom the volume is intended. If, as stated, the booklet is aimed at active naturalists who want to undertake their own investigations, then it will act as little more than an introduction to the various groups. In this context, the addresses and references are perhaps the most useful features. It is unfortunate that the Yorkshire Naturalists' Union is not listed under the section on societies, particularly as *The Naturalist* is picked out as one of the main publications in which research projects can be published, (although it wrongly states that it is merely "a journal which concentrates on work of relevance to Yorkshire", and not, as it should be, to the north of England).

The handbook is a useful introduction but I wonder how many serious naturalists will buy it for their own bookshelves.

AN

SNIPE

Photo: J. Vaughan

One wonders how much longer the snipe *(Gallinago gallinago)* will remain "a common bird over most of Yorkshire", as it was when John Mather's *Birds of Yorkshire* came out in 1986, and perhaps still is, though breeding numbers in Vice-County 64 have been reported low in recent summers. This bird was photographed at Hornsea Mere in autumn, when continental immigrants arrive in large numbers and the Mere can hardly be visited without a snipe being flushed.

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Photographic Plates

Readers of *The Naturalist* will have noticed that the number of photographic illustrations has increased in recent years. Good clear photographs, suitably captioned, to accompany articles or as independent features are always welcome.

To encourage this development, a long-standing member of the YNU, who wishes to remain anonymous, has most generously offered to make a donation, the income from which would finance the publication of a plate or equivalent illustration in future issues whenever possible. The editor, on behalf of the YNU, wishes to record this deep appreciation of this imaginative gesture.

All YNU matters should be addressed to:

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THE DISAPPEARANCE OF THE STONE-CURLEW *BURHINUS OEDICNEMUS* AS A BREEDING BIRD IN YORKSHIRE

HENRY O. BUNCE[1] AND RICHARD VAUGHAN[2]
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This paper aims to bring together information on the extinction of breeding Stone-curlews in Yorkshire. As sources of information the three Yorkshire avifaunas are disappointing. Nelson's (1907), written while the Stone-curlew still bred in Yorkshire, is guarded and scant; Chislett (1952) only gives sparse information on the extinction of the species as a breeding bird in 1920-1940; Mather (1986) adds little, being content in the main to repeat his predecessors. An important source of information is Wade's (1909) paper read at a meeting of the Vertebrate Section of the Yorkshire Naturalists' Union, probably on 21 November 1908. Much information comes from the Annual Reports of the YNU's Wild Birds and Eggs Protection Act Committee (see Varty, 1991), those of its Vertebrate Section, printed in the *Naturalist*, and from conversations and correspondence with Yorkshire ornithologists. No systematic search has been undertaken to locate private diaries or specimens in museums: the few soundings made yielded little. Nor have the

FIGURE 1
Places mentioned in text.

YNU's unpublished files and minute-books been exhaustively searched. Nonetheless, it is hoped that sufficient data have been gathered for a worthwhile review of the Stone-curlew's status in the last century of its existence as a Yorkshire breeding bird and of the reasons for its disappearance. The locations of places mentioned in the text are shown in Figure 1.

The Stone-Curlew

This large sandy-brown plover-like bird, with stubby beak, prominent yellow-rimmed eyes, and long legs, is mainly nocturnal and feeds on soil invertebrates and insects. It is about the same size as the Lapwing *(Vanellus vanellus)* and in Britain often shares the same habitat. The sexes were long treated as similar (e.g. Cramp & Simmons, 1983: 67, 78-79), but more recently it has been claimed that they are distinguishable in the field (Green & Bowden, 1986). The Stone-curlew is territorial, has a group display in autumn assemblies, is site-tenacious, and is a summer visitor to Britain between March and November. British birds winter in Southern Europe and North Africa. It lays two eggs in a scrape on the bare ground, usually lays a replacement clutch if the first is lost, and is sometimes double-brooded. In Asia, the Stone-curlew is found in arid habitats. In northwest Europe it breeds or has bred on chalk downs, sandy heaths, coastal sand dunes, and gravel or sand banks in rivers, as well as on arable land. Two important habitat requirements are the absence of disturbance, especially by human beings, and bare ground or extremely short vegetation for nest sites (Green & Griffiths, 1994; Green & Taylor, 1995). Its range in Britain is predominantly eastern and southern, and it has probably always been absent from the cooler and wetter northwest.

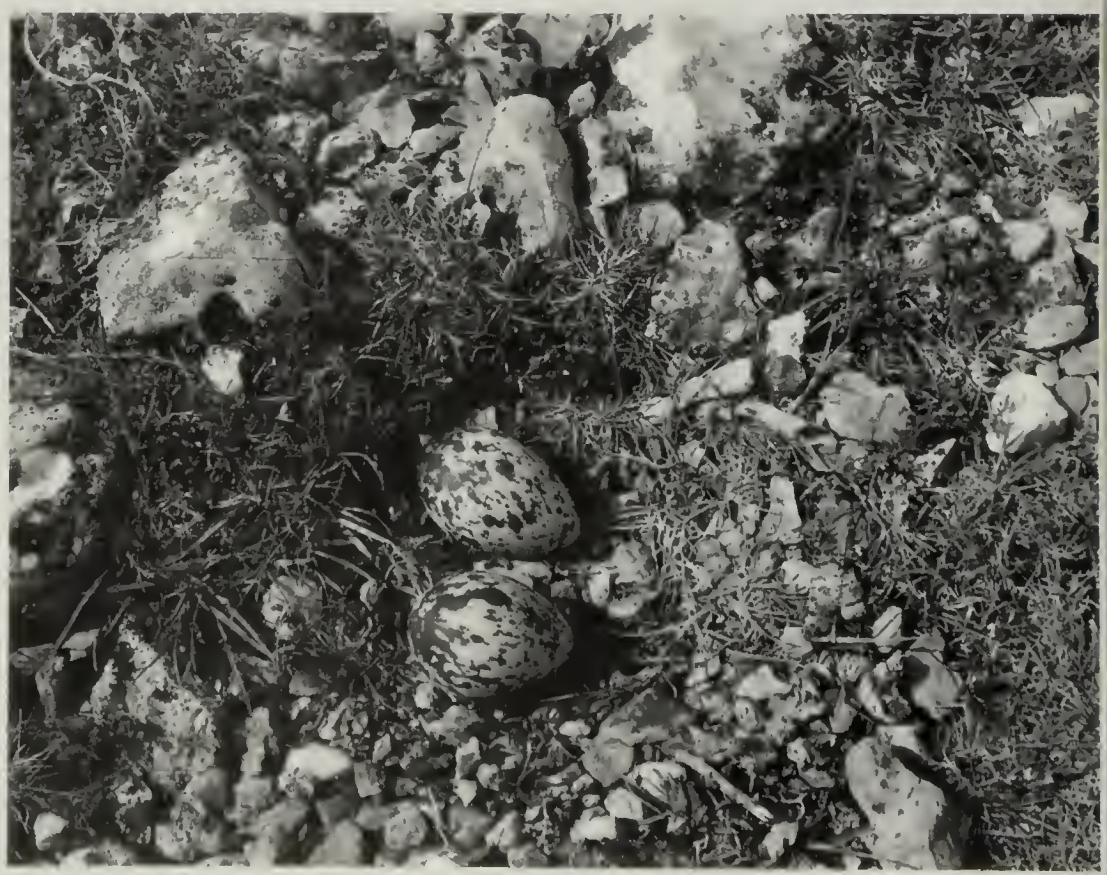

PLATE 1
Nest and eggs of Stone-curlew, France, 30 May 1995.

PLATE 2
Stone-curlew approaching nest, France, 30 May 1995.

Declining Populations

The disappearance of breeding Stone-curlews from Yorkshire was part of a wider phenomenon which still continues. As far back as historical records go in Britain the species has been in numerical decline. Already in 1868 it was reported as "formerly numerous on the downs and hills of Berkshire" (Clark Kennedy, 1868: 97). In Norfolk in 1870 its "former abundance in this county" was mentioned (Stevenson, 1870: 51). Between about 1970 and 1990 the English population declined from an estimated 300-500 pairs to 150-160 pairs (Gibbons *et al.*, 1993: 160) and the range contracted to two main areas, centred on the East Anglian Brecklands and Salisbury Plain. On the continent the Stone-curlew became extinct in Holland and Germany in the twentieth century (Glutz von Blotzheim *et al.*, 1977: 784-785). In France its numbers are said to have diminished by between 20 and 50 per cent in the years 1970-1990 (Yeatman-Berthelot & Jarry, 1994: 36). Even in parts of Spain there is recent evidence of declining numbers (Barros, 1994). Thus, throughout northwest Europe in the last 150 years or more the breeding range of the Stone-curlew has greatly contracted and its numbers have declined steeply.

The Yorkshire population (see Fig. 2) was on the margin of the Stone-curlew's range, and, at around 54°N latitude, comprised of the world's most northerly breeding Stone-curlews. The contraction of the species' range did not result in the most northerly populations disappearing first. On the contrary, the first of the Stone-curlew populations in northern England to disappear were those breeding on the Lincolnshire Wolds and on the heaths of northwest Lincolnshire. The last recorded breeding on the Lincolnshire Wolds was about 1870. On the heaths, or commons, "C. May, of Laughton Lodge, took the eggs of the last pair of stone-curlew nesting on Scotton Common . . . in 1886, and shot the

birds" (Cordeaux, 1899: 29). Other breeding places were the heaths at Brumby, Manton and Risby – all deserted by 1905 (Wade, 1909; Lorand & Atkin, 1989: 110). Further north, in Yorkshire, the more southerly of the two largest groups, that on the Yorkshire Wolds, ceased to exist in the early 1920s. The North Yorkshire population survived until the mid-1930s.

Changing Habitats

Some 250 years ago, around 1750, Yorkshire possibly held its largest-ever Stone-curlew population. At any rate there was probably more suitable habitat then than at any time before or after. As described by Arthur Young in 1770, much of the Yorkshire Wolds was a barren, uncultivated wasteland, given over to sheep walks. Stone-curlews must have thrived along with Great Bustards *(Otis tarda)* on these stony, short-cropped grasslands. Elsewhere, there were still expanses of sandy or stony heathland east of Doncaster, in the eastern Vale of York, and along the lower, southern slopes of the North York Moors – all prime Stone-curlew ground. In all these areas there were rabbit warrens (Harris 1971, Harris & Spratt, 1991; Clarke, 1937: 108-111), for the mid-18th century marked the culmination of the large-scale production of rabbit meat and skins in warrens or rabbit farms. These rabbit warrens were almost perfect habitats for the Stone-curlew: the Norfolk Wildlife Trust's reserve at Weeting Heath, Norfolk, famous for its breeding Stone-curlews, is virtually such a rabbit warren. The size of the average Yorkshire warren was about 1,000

PLATE 3
Incubating Stone-curlew, France, 30 May 1995.

acres (400 hectares). It was enclosed with substantial sod walls and might carry several thousand couples of rabbits. Sheep were grazed in many warrens and winter feed, in the shape of gorse and brushwood, was provided for the rabbits, which were caught in pitfall traps called tipes. Change came rapidly: whereas in the East Riding in 1808 some 15-20,000 acres (6-8,000 hectares) in 20 different places were occupied by rabbit warrens, by 1850 almost all of them had gone under the plough. The reclamation of warren land went hand-in-hand with the breaking up of sheep walks into fields for arable cultivation known as enclosures. This destruction of Stone-curlew habitat in Yorkshire continued through the 19th century, both on the Wolds and elsewhere. Further incursions into the remaining Stone-curlew breeding grounds were made in the 19th century by landowners creating windbreaks and plantations, and in the 20th century by large-scale forestry schemes.

The regime of successional heather-burning introduced in the North York Moors in the mid-19th century as part of grouse management (Spratt & Harrison 1989: 18) did not apparently offer the Stone-curlew a viable new habitat of bare, burnt ground. This ground was peaty, whereas the bare patches resulting from heather burning in lowland heaths are often sandy or stony. This was the case in the Lincolnshire heaths. Charles Dixon (1888: 183), who collected eggs on the north Lincolnshire heaths in the late 19th century, advises his readers to "search the barest ground for the eggs of the Stone-curlew – places where the heather has been burned in previous years, leaving the ground rough and stony . . .".

Distribution and Numbers

By about the time of the earliest records of Stone-curlews in Yorkshire, which date from 1836 and 1844, the rabbit warren and sheep-walk habitats were in the last stages of destruction. Four or five discrete breeding populations of Stone-curlew survived, nearly all of them on former rabbit warrens. These populations were found at altitudes ranging from about 230m (750 feet) above sea level on the Wolds near Uncleby (Martin Stringer, *pers. comm.*) and in Dalby Warren, to 10m (30 feet) above sea level near the Market Weighton Canal. They were found in:

1. Lowland heaths near Doncaster. One of the few categorical statements about Yorkshire Stone-curlew localities refers to this population: in 1844 Thomas Allis wrote (Nelson 1907b: 561) that "The Great Plover – breeds at Rossington and other places near Doncaster". Among these places, besides the warren north of Rossington, now a golf course, may have been two localities east of Doncaster aptly called Gravel Hill Plantation and Warren Farm (letter from Reg Rhodes to Henry Bunce 12/10/1988). This population, which had probably disappeared by 1850, may have numbered fewer than six pairs.

2. Lowland sandy heaths on the eastern fringe of the Vale of York. Situated on either side of the Market Weighton Canal, the most important sites were near Holme upon Spalding Moor, Tollingham Moor and South Cliffe Common. Although, according to Wade (1909: 12) "Tollingham Moor was ploughed up previous to the sixties", J. Cordeaux claimed in 1872 that the Stone-curlew still nested there annually (he erroneously called it Tollington), as well as on "Spalding Moor". Wade mentions eggs taken in this area in the period 1868-1873 by N. F. Dobrée of Beverley and F. Boyes. Dobrée (1897) possessed "a large series" of Stone-curlew's eggs from this area which he obtained from the farm boys who came across them when collecting Lapwings' eggs for the London market. Wade also mentions a "Mr. Jno Reynolds", living at South Cliffe in 1909, who well remembered seven or eight pairs breeding near there. Taking into account other possible sites in this area, the population may have numbered up to 30 pairs in all. It probably died out soon after 1875.

3. The Wolds. Here, Stone-curlews were originally widespread, especially on the fine series of "whale-back" ridges extending from about North Newbald in the south to Birdsall, and along the northern fringe of the Wolds across to the sea. In Wade's time (1909: 13), there were "broad sweeps of open country, fields of one hundred acres or

more, covered with a soil largely composed of chalk and flints, out of sight of the villages, which, as a rule, nestle in secluded hollows". Stone-curlews nested on the Wolds throughout the 19th century. Nelson (1907b: 562) was given an "interesting selection" of eggs taken on the northern Wolds by J. Braim of Pickering in the 1850s and 1860s. Breeding was recorded near Market Weighton in 1881 (*Naturalist* **9**: 1883-1884: 172) and at Fimber, Burdale and Thixendale in the four years up to 1886 (*Naturalist* **11**: 1886: 48). Already in the early years of the 19th century the species was in fast decline: A. Strickland is quoted (Allis, 1844, in Nelson, 1907b: 561) as stating that it "used regularly to breed on the Wolds, but never abundantly since my knowledge, and I have known both the egg and young bird found, but they are now seldom met with . . .". It seems from Wade's (1909) account that at least part of the Wolds population was breeding in his time on arable land. He describes how, given the system of crop rotation then in use on the Wolds, the eggs of breeding Stone-curlews would certainly be destroyed in two years out of every four. He also points out that some birds nested in plantations (illustrated in Nelson, 1907b: 564). An idea of the size of the Wolds population may be derived from an autumn assembly of about 40 birds seen on rough grassland at Ganton on 9 October 1874 (Nelson, 1907b: 563-564), and from Wade's assertion in 1909 that he knew of more, but evidently not many more, than four or five breeding pairs. Subsequently, the population seems to have shrunk to a single breeding group on the Warter estate in the southern Wolds, where 17 birds were seen in October 1917 (*Naturalist* **42**: 1917: 33). In spite of the efforts of the YNU to protect these birds, the last two pairs probably bred in 1922 (*Naturalist* **48**: 1923: 30).

4. Southern fringe of the North York Moors. Clarke and Roebuck (1881) reported that the Stone-curlew had bred on Levisham Moor near Pickering, on the Hambleton Hills, and near Scarborough. Levisham Moor is only three miles (5km) from the complex of former rabbit warrens known as Dalby Warren, which harboured a small population of Stone-curlews throughout the 19th and first third of the 20th century. Next to nothing is known of Stone-curlews on the Hambleton Hills. Nelson probably took his mention of them (1907b: 563) from Clarke and Roebuck (1881). Much later, perhaps in the 1920s, the York bird photographer Fred Jefferson photographed breeding Stone-curlews at an unknown locality with the aid of the head keeper of Duncombe Park, Adam Gordon. Could this have been on Scawton Moor or Rievaulx Moor in the Hambleton Hills? (Letter of John Armitage to John Cudworth, 30 October 1987). As to the Stone-curlew breeding "near Scarborough", it seems possible that Dalby Warren, less than 10 miles from Scarborough as the crow flies, is the locality referred to, unless arable fields much nearer Scarborough were meant. This information apparently derived from a paper read to the Zoological Society of London in 1836: the speaker, W. C. Williamson, said that the "Great or Thick-kneed Plover breed on the fallows and often startle the midnight traveller by their shrill and ominous whistle". Apart from these two shadowy outliers, on the Hambleton Hills and possibly near Scarborough, we are left with a well-documented North Yorkshire Stone-curlew population centred on Dalby Warren, and extending to neighbouring Levisham Moor and Allerston Warren. In none of the many references to it in the *Naturalist* was this site explicitly named Dalby Warren; once only was its whereabouts disclosed with the words "Thornton Dale district" (*Naturalist* **58**: 1933: 23). R. M. Garnett was able to confirm verbally to the first author that Dalby Warren was meant. This is the area which, planted with trees from 1920 onwards, is now Dalby Forest. Here a handful of pairs of Stone-curlew, probably never more than about seven in one year, bred annually with some success between 1908 and 1928, then dwindled, as the area became forest, until a final pair bred successfully in 1935 (annual report of YNU Protection Committee and of the Vertebrate Section in the *Naturalist*). We have not been able to substantiate the assertion of Ralph Chislett (1952: 271) that "an odd pair was known to breed in 1936 and 1937".

PLATE 4
Stone-curlew pair at nest, France, 2 June 1995.

ADULT MORTALITY

Once they have reached maturity, Stone-curlews have few natural predators though one may occasionally succumb to a fox. In Yorkshire, as elsewhere, adults were shot for their skins by bird collectors and occasionally for sport or just out of curiosity. It is impossible to quantify the evidence for this kind of mortality, which must remain anecdotal. Boulton (1864) of Beverley reported to the *Zoologist* that a farmer had shot "a very fine old female specimen of this plover" on 2 June 1864 near Holme upon Spalding Moor. A friend of Boulton had found a nest with a single egg in this locality "when trying to get a shot at the parent bird". Boulton himself, according to Nelson (1907b: 562), possessed specimens from Holme upon Spalding Moor obtained in 1864 and 1865, only about 10 years before this small population became extinct. On the Wolds, a bird was shot near Wetwang on 29 July 1909 and is now in the Yorkshire Museum, York (Denton 1995).

BREEDING SUCCESS

Against a background of pressure on Stone-curlew populations due to changing land use, including loss of eggs through farming operations, egg collecting must have helped to limit the breeding success of the species. This must have been especially the case when eggs were taken over the years from a single locality, such as happened on the lowland sandy heaths in the Vale of York (Dobrée, 1897). At Londesborough, on the Wolds, Wade (1909: 4) reported that, over a period of 40 years, the Stone-curlew attempted to breed on three occasions but on each occasion the eggs were taken; the last was in May 1906, when the

birds were "destroyed or driven away". The Dalby Warren Stone-curlew population was also a prey to egg collectors. Oxley Grabham (1897) reported that a clutch was taken there in 1897 and, in the same year, the sum of £5 was offered for a clutch of eggs from this locality (as against a normal dealer's price of one shilling for an "ordinary" Stone-curlew's egg, taken in the south of England where the Stone-curlew was still common). In 1909, Wade reported that, to his certain knowledge, eggs had been taken more than once "in recent years" on what must have been Dalby Warren, but there seems to be only one authenticated case of a clutch of Stone-curlew's eggs taken there: on 10 June 1911 what was probably a replacement clutch was taken by or for a prominent member of the YNU, C. W. Mason, who later sat on the Union's bird protection committee (Varty, 1991: 54). His collection was presented in 1966 to the Hull City Museum by his widow. He should not, however, be singled out as a culprit: many of his colleagues in the Vertebrate Section of the YNU collected eggs and/or skins.

From at least 1910 onwards the YNU, through its Wild Birds and Eggs Protection Act Committee, embarked on one of the earliest sustained efforts to conserve a rare breeding species. These efforts were comparable to those made in the same period by a small band of enthusiasts to protect the few remaining pairs of breeding Red Kites *(Milvus milvus)* in Wales. In each of the Stone-curlew's last two Yorkshire strongholds, at Warter on the Wolds and at Dalby in North Yorkshire, the gamekeeper(s) of the relevant estates were paid annually to protect the birds and encouraged to report on their breeding success

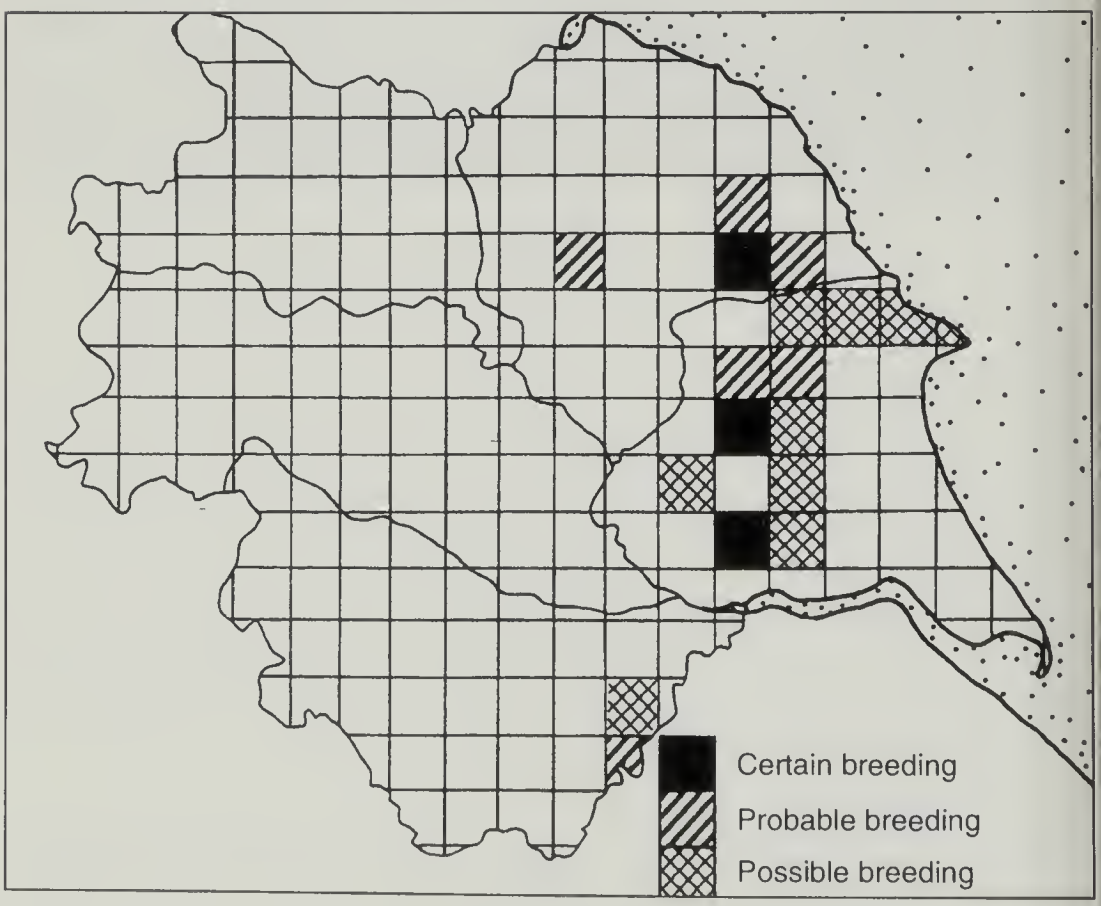

FIGURE 2
Breeding range of the Stone-curlew in Yorkshire in the 19th and early 20th century based on 10km x 10km grid. Watsonian vice-county boundaries are denoted by a continuous line.

(Annual Reports of the YNU Protection Committee printed in the *Naturalist*). From Warter the available data are insufficient, but the annual reports from Dalby Warren for the years 1922-1929 show that, under this protection, Stone-curlew breeding success was probably adequate to maintain the population. Three or four pairs nested annually at this time and young fledged every year – four in 1927, at least three in 1928. Even if, as Ralph Chislett (1952: 271) later implied, the misbehaviour of somebody involved, perhaps a keeper, allowed some eggs to appear for sale in Scarborough, or elsewhere, the efforts of the Protection Committee seem to have been successful.

Causes of the Decline and Disappearance

In Yorkshire, the ploughing up or afforestation of rabbit warrens and other suitable habitat was probably the main reason for the decline of the Stone-curlew. Egg-collecting undoubtedly accelerated the bird's disappearance, but was not a prime cause, though the extinction of the last two breeding colonies within five years of the first publication of the localities, does make one wonder. Virtually all authorities on the decline of the Stone-curlew in Britain attribute it to habitat loss. Chislett (1952) blamed cultivation and afforestation; Campbell and Lack (1985) said the same; and Holloway (1996: 168) blamed the "conversion of semi-natural grassland and heath to arable land and conifer plantations". True, some Yorkshire Stone-curlews switched to nesting on arable land (two nests were recorded in 1917 in growing corn and turnips, no localities given, *Naturalist* **43**: 1918: 33), or to young plantations, and others may well have been overlooked. The story of the wiping out of Yorkshire's last breeding Stone-curlews by the Forestry Commission, which began planting up Dalby Warren with conifers in about 1920, is graphically reflected in the annual reports of the YNU's Protection Comittee, covering the Stone-curlew's last 11 years as a known breeding bird in Yorkshire:

Year	Reference in the *Naturalist*	Remarks
1925	**51** (1926): 13-15	6 pairs seen, 4 nests found, 2 broods of young seen.
1926	**52** (1927): 55	5-6 pairs arrived, 3 clutches of eggs seen, young known to have fledged.
1927	**53** (1928: 122	6 pairs present, 3 clutches of eggs seen, 4 young flew.
1928	**54** (1929): 87	4-5 pairs arrived; 3 pairs nearby [?Allerston Warren]. All thought to have reared young.
1929	**55** (1930): 84	2-3 pairs reared young. "Feared afforestation may have something to do with [absence of] the other pairs we usually note. Either birds were not observed among new-trees or [tree] planting has made them move."
1930	**56** (1931): 15	At the end of "a fair season", gamekeeper James Green reported having seen 7 together ready for migration.
1931	**57** (1932): 23	5-6 pairs nested. "Re-afforestation has crowded out some birds, but they are finding neighbouring places where they can breed."
1932	**58** (1933): 23	2 pairs nested. "Nesting ground nearly all planted up. Pair reported as frequenting a 50-acre rough pasture below the village, no sign of nesting."
1933	**59** (1934): 24	J. Green "reports that the Stone-curlew is being lost to us. Only 2 pairs turned up and he thinks neither successfully nested. Under the re-afforestation scheme, the nesting grounds are planted out and the bare spaces are continually disturbed by bracken mowers and tree planters. One of the Forestry Commissioners reported a pair near Troutsdale Head, on a patch of broken ground. It is possible that this pair may have nested".

1934	**60** (1935): 42	No mention of Stone-curlews. Keeper J. Green was paid his usual £3.
1935	**61** (1936): 24	"A pair re-appeared in North Yorkshire and successfully reared 2 young". A second pair, which probably nested, was recorded in a new situation.

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MARITIME FESCUES (*FESTUCA RUBRA* L. SUBSPECIES AND *F. ARENARIA* OSBECK) IN S.E. YORKSHIRE

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ABSTRACT
Notes on the occurrence, habitat and description of two maritime *Festuca rubra* L. subspecies and of *F. arenaria* Osbeck on the north bank of the Humber estuary and Spurn, S.E. Yorkshire (VC61), are presented.

INTRODUCTION

The taxonomy of the *Festuca rubra* agg. in the British Isles was revised in 1991 (Al-Bermani & Stace, 1991) and incorporated into Stace (1991). This revision elevated *F. rubra* L. subsp. *arenaria* (Osbeck) F. Aresch. to species rank as *F. arenaria* Osbeck, and some varieties of *F. rubra* subspecies to subspecies rank within the *F. rubra* L. agg.

In the case of *F. arenaria* Osbeck, the change of name came just too late for inclusion in the Flora of the East Riding of Yorkshire (Crackles, 1990), where it is recorded as *F. rubra* L. subsp. *rubra* var. *arenaria* Fries. Two other subspecies, namely *F. rubra* subsp. *juncea* (Hackel) K. Richter and *F. rubra* subsp. *litoralis* (G. Meyer) Auq., were first recorded for this region in 1994 and 1995 respectively (**Hb PJC**, det. C. A. Stace).

Places of occurrence, habitat details and a description enabling initial field recognition is given for each plant.

Festuca arenaria Osbeck

This taxon now incorporates both *F. rubra* L. subsp. *arenaria* (Osbeck) F. Aresch. and Rush-leaved Fescue (*Festuca juncifolia* St.-Amans.). It occurs in quantity on mobile dunes on the Spurn peninsula (GR TA41), often occurring in extensive areas on its own or with Lyme-grass (*Leymus arenarius* (L.) Hochst.) and Marram (*Ammophila arenaria* (L.) Link). It also occurs on a small disturbed grey dune area on the Humber bank at Easington (GR TA31) in association with Sand Sedge (*Carex arenaria* L.), Flattened Meadow-grass (*Poa compressa* L.) and Storksbill (*Erodium cicutarium* (L.) L'Her.).

This subspecies has very long rhizomes and probably plays a part in binding sand, in common with most other species found with it. Its leaves are folded along their length and are without auricles. In general habit and appearance it is a tall (to 90 cm) and loose grass, with a pale blue hue.

Festuca rubra subsp. *juncea* (Hackel) K. Richter
This taxon now incorporates *F. rubra* subsp. *pruinosa* (Hackel) Piper, which the Humber estuary populations would formerly have been named. This grass has been found growing on its own on compressed gravel at the margin of temporary pools on tracks along the top of the Humber flood defence bank. It has been found near both Welwick and Skeffling (GR TA31), and near Kilnsea (GR TA41).

This subspecies has short rhizomes and therefore tends to be tufted. In general appearance it is a highly colourful grass with pink stems, brown or purple-brown nodes, blue leaves, a "red fescue" appearance to the panicle and an intense pruinose bloom. In the locations described it is dwarfed which tends to enhance both the tufted appearance and the coloration. It is therefore a conspicuous plant and very easy to find.

Festuca rubra subsp. *litoralis* (G. Meyer) Auq.
This grass has been found to occupy the wet mud of the north bank of the Humber estuary, often growing in extensive dense mats on its own, or in close association with Common Saltmarsh-grass (*Puccinellia maritima* (Hudson) Parl.). It was first found at Welwick saltmarsh (GR TA31) and subsequently in several stations along the saltmarsh as far as Wyke Bite on the west side of the Spurn peninsula (GR TA41). In 1996 it was found on the saltmarsh near Yokefleet (GR SE82), (YNU VC61 Field Meeting) growing close to beds of Saltmarsh Rush (*Juncus gerardii* Loisel.).

This subspecies has characteristically short culms, large lemmas (up to 8mm) with very long awns (up to 2.8mm), and short, narrow folded leaves; it has a distinct preference for wet saline mud. It appears that adjacent panicles become locked together by their awns and bundles of many culms may be found lying on the wet mud after tidal waters have receded. The depositing of so many caryopses in one place could account for the formation of very dense mats.

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FIELD NOTE

In July 1986 I found the hybrid *Epilobium parviflorum* L. x *E. palustre* L. = *E. x rivulare* Whalenb. in a marshy area near Withernsea. One shoot examined in the field had a stigma which, though neither four-lobed nor club shaped, had incipient lobing. Another specimen had club shaped stigmas but resembled *E. parviflorum,* having broad based lobes of greyish appearance due to their hairiness. The notch in the petals was found to be short, 0.5 of petal length and the flowers were variable in size, 8.0mm or 9.5mm in diameter. The capsules were short and almost empty and there was an absence of hairs on the undeveloped seeds.

Stace (1975) records *E. x rivulare* as occurring in 17 VCs in the British Isles. The above is the first Yorkshire record.

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F. E. Crackles

THE ACULEATE WASPS AND BEES (HYMENOPTERA: ACULEATA) OF TWO CALCAREOUS LOCALITIES IN WATSONIAN YORKSHIRE: BURTON LEONARD LIME QUARRIES AND CAVE WOLD

MICHAEL E. ARCHER

Burton Leonard Lime Quarries and Cave Wold are good localities for aculeate wasps and bees. Burton Leonard has 75 recorded species with three species of national importance, and two species of regional importance. Cave Wold has 79 recorded species, with one species of regional importance.

Burton Leonard Lime Quarries (SE36, VC64) is an area of about 22 ha., about one km. south of the village of Burton Leonard, and about eight km. south of Ripon. It mainly consists of two abandoned quarries on the Magnesium limestone hills, last worked in the late 1940s. It has a rich calcareous flora including flowering shrubs, e.g. hawthorn, and a developing ash woodland.

Cave Wold (SE93, VC61) is a linear locality of about 40 ha., about three km. north-east of South Cave. It mainly consists of a disused railway line with steep-sloping embankments, foot paths, and the calcareous grassland of the Yorkshire Wolds. It is rich in flowering herbs and flowering shrubs, e.g. hawthorn.

During 1978, and between 1987 and 1994, 16 visits were made to Burton Leonard throughout the year as follows: April (2 visits), May (4), June (3), July (3), August (3) and September (1). Records also are available from K. G. Payne and A. Godfrey (one visit, July 1990), from which nine species were determined.

Between 1986 and 1994, I made 16 visits to Cave Wold, throughout the year as follows: April (1 visit), May (3), June (3), July (5) and August (4). Two of the visits during July and one visit during August were unsuitable for surveying because of poor weather conditions. Records available from W. D. Roebuck (one visit, 1907), D. H. Smith (one visit, August 1957) and A. Norris (one visit, August 1976). I determined the specimens of D. H. Smith (one species) and A. Norris (one species) but the three species of W. D. Roebuck are known from Butterfield and Fordham (1930).

My visits lasted approximately three hours when all species of aculeate wasps and bees were recorded and usually collected with a hand net for identification.

In the following account, biological names are according to Kloet and Hincks (1978).

Species Present

At the family level, Table 1 shows the taxonomic distribution of species and records at Burton Leonard and Cave Wold. A record represents a specimen differing in one of the following three variables: name, sex, and day of visit. At both Burton Leonard and Cave Wold the dominant solitary wasp family is the Sphecidae and the dominant bee family is the Halictidae. The number of records of Eumenidae (e.g. *Ancistrocerus trifasciatus*, Table 2) and Andrenidae from Burton Leonard, and Pompilidae (e.g. *Priocnemis perburbator*, Table 3) and Andrenidae from Cave Wold also are noticeable.

The social wasps recorded at both Burton Leonard and Cave Wold were: *Dolichovespula sylvestris, Vespula rufa, Paravespula germanica*, and *P. vularis;* the social bees were: *Bombus lucorum, B. terrestris, B. lapidarius, B. pratorum, B. hortorum, B. pascuorum, Psithyrus bohemicus, P. sylvestris, P. vestalis* and *Apis mellifera*. In addition *Psithyrus barbutellus* was recorded at Cave Wold.

Tables 2 and 3 show the number of days on which each species of solitary wasp and bee were recorded. For Burton Leonard, 42 species (68.9%) were recorded on one, two or three days (unusual species) and 19 species (31.1%) on from four to 13 days (common species). For Cave Wold, 40 species (62.5%) were recorded on one, two or three days and 24 species (37.5%) on from four to 14 days. The solitary wasp species were more likely to be the

unusual species (24 at Burton Leonard, 26 at Cave Wold) rather than common species (six at Burton Leonard, four at Cave Wold). The reverse is more likely for the solitary bee species (Common species: Burton Leonard, 18 species; Cave Wold, 14 species. Unusual species: Burton Leonard, 13 species; Cave Wold, 20 species).

TABLE 1
The number of species and records of aculeate wasps and bees recorded from Burton Leonard Lime Quarries (BL) and Cave Wold (CW).

	No. species		No. records	
	BL	CW	BL	CW
Solitary wasps				
Chrysididae	3	3	10	5
Mutillidae	1	0	4	0
Sapygidae	1	0	2	0
Pompilidae	3	7	10	22
Eumenidae	6	5	20	7
Sphecidae	16	15	29	27
Total Solitary wasps	30	30	75	61
Solitary bees				
Colletidae	1	2	2	4
Andrenidae	10	10	43	64
Halictidae	14	15	82	84
Megachilidae	1	1	2	1
Anthophoridae	5	6	12	20
Total solitary bees	31	34	141	173
Total solitary wasps & bees	61	64	216	234
Social wasps and bees				
Vespidae	4	4	–	–
Apidae	10	11	–	–
Total social wasps & bees	14	15	–	–
Total aculeate wasps & bees	75	79	–	–

Seasonal Progression of the Solitary Species (Table 4)

For the number of solitary wasp species, June and July were the most productive months at both Burton Leonard and Cave Wold. For the number of new species June, followed by July, were the most productive months for Burton Leonard, and July, followed by June, for Cave Wold. Except for four spider-hunting wasps, the solitary wasps did not appear until June, and can be considered summer species. Of the four spider-hunting wasps, only *Priocnemis perturbator* is a spring species while the other three are summer species, although they might first appear in late spring (Fig. 1).

For the number of solitary bee species the most productive months at Burton Leonard are May and June, and at Cave Wold June. For the new species April and May are the most productive months for both localities. The lack of agreement between the most productive months for the number of species and new species is because the bee fauna is dominated by spring bees and spring and summer bees, with very few summer bees (e.g. *Anthophora furcata*) (Archer, 1966a).

Comparison of the Two Localities

Of the 87 solitary species recorded from the two localities, 38 were recorded from both localities, 23 only from Burton Leonard, and 26 only from Cave Wold.

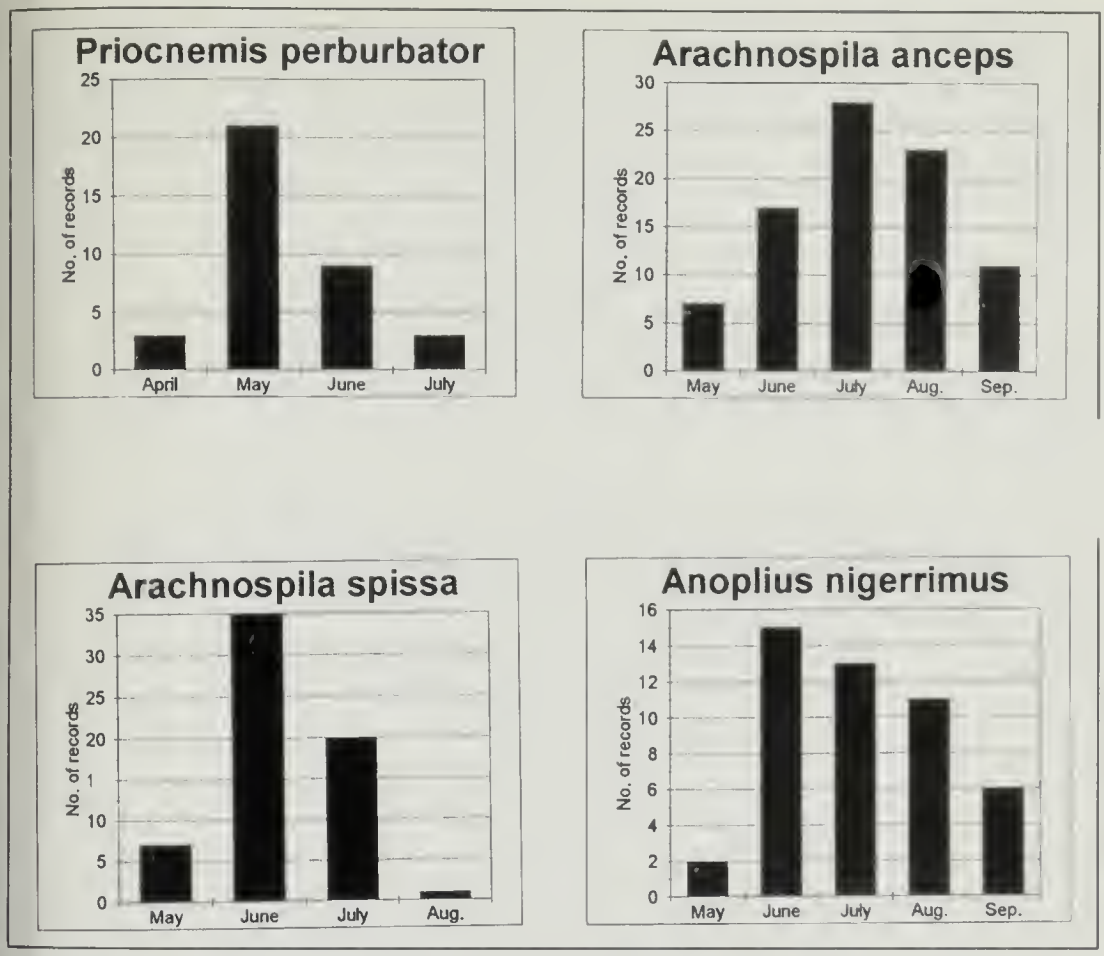

FIGURE 1
The seasonal distribution of four species of spider-hunting wasps (Pompilidae) using all available data from Watsonian Yorkshire.

These data can be compared by calculating similarity indices. Using the simple Jaccard index (Ludwig & Reynolds, 1988), which depends on the presence or absence of species, gives an index of 43.7%. For the solitary bee species, the Jaccard index is higher (62.5%) than for the solitary wasp species (27.7%). This variation of similarities can be related to the number of days each solitary species was recorded (Tables 1, 2). The mean number of records per solitary bee species (4.8 records) was greater than the mean number per solitary wasp species (2.3 records). It is therefore about twice as likely to record a particular bee species as a wasp species, although, overall, more solitary wasp species (47) were recorded than solitary bee species (40).

The Morisita-Horn index, which uses quantitative information on the relative abundance of species, is relatively independent of sample size but gives more importance to the more abundantly-occurring species (Magurran, 1988). Abundance was determined from the number of days on which each species was recorded. The Morisita-Horn index for the solitary species is 77.8% which is higher than the Jaccard index. This indicates that the two localities are more similar to one another in terms of common species. Of the 49 species found in only one of the localities, only seven (14.3%) were common species, found on more than three days. In contrast, of the species found at both localities, 23 (60.5%) were common, at least at one of the localities.

Quality Assessment of the Solitary Species

Three species from Burton Leonard are nationally scarce species (Falk, 1991), with *Sapyga clavicornis* and *Sphecodes crassus* at the northern edge of their range in England, and *Priocnemis schioedtei* widely distributed throughout Britain. Regionally (Archer, 1993a), *S. clavicornis* and *S. crassus* are rare species while *P. schioedtei* is a common species. Regionally *Sphecodes puncticeps* from Cave Wold is a rare species.

TABLE 2
The number of days on which each species of solitary wasp and bee species was recorded at Burton Leonard Lime Quarries.

No. records	No. days	Species	No. species
14	1	*Symmorphus gracilis, Trypoxylon figulus, Crossocerus elongatulus, C. dimidiatus, Psen dahlbomi, Pseudus concolor Pemphredon lugubris, Passaloecus insignis, Andrena clarkella, A. fucata, A. helvola, Lasioglossum morio, Sphecodes crassus, Anthophora furcata.*	14
36	2	*Chrysis angustula, Sapyga clavicornis, Priocnemis schioedtei, Odynerus spinipes, Ancistrocerus gazella, A. oviventris, Trypoxylon clavicerum, Crossocerus tarsatus, C. pusillus (=varus), C. podagricus, Pemphredon inornatus, Passaloecus singularis, Hylaeus communis, Andrena fulva, Lasioglossum villosulum, L. lucopum, Chelostoma florisomne, Nomada goodeniana.*	18
30	3	*Arachnospila anceps, Ancistrocerus parietinus, Ectemnius cavifrons, Rhopalum coarctatum, Andrena chrysosceles, Lasioglossum rufitarse, Sphecodes hyalinatus, Nomada flavoguttata, N. marshamella, N. ruficornis.*	10
20	4	*Chrysis impressa, Trichrysis cyanea, Myrmosa atra, Crossocerus ovalis, Andrena nigroaenea.*	5
15	5	*Arachnospila spissa, Lasioglossum albipes, Sphecodes monilicornis.*	3
18	6	*Andrena bicolor, A. scotica, Halictus rubicundus.*	3
8	8	*Andrena saundersella.*	1
18	9	*Halictus tumulorum, Sphecodes fasciatus.*	2
10	10	*Ancistrocerus trifasciatus*	1
22	11	*Andrena haemorrhoa, Lasiolglossum fratellum*	2
12	12	*Lasioglossum calceatum*	1
13	13	*Lasioglossum fulvicorne*	1

Five species have a local distribution in a regional context (Archer, 1994): *Andrena clarkella* from Burton Leonard, and *Chrysis ruddii, Tachysphex pompiliformis, Oxybelus uniglumis* and *Mellinus arvensis* from Cave Wold.

By giving each solitary species a regional status (Archer, 1993a) Burton Leonard would have a regional quality score of 143 and a species regional score of 2.3 (143/61 species). Cave Wold would have a quality score of 108 and a species quality score of 1.7 (108/64 species) (Table 5).

Using a national status for each species (Archer, 1995), Burton Leonard would have a national quality score of 98 and a national species quality score of 1.6 (98/61), and Cave Wold would have a quality score of 76 and a species quality score of 1.2 (76/64) (Table 6).

TABLE 3
The number of days on which each species of solitary wasp and bee species was recorded at Cave Wold.

No. records	No. days	Species	No. species
21	1	*Chrysis impressa, C. ruddii, Dipogon subinternedius (= nitidus), Evagetes crassicornis, Ancistrocerus parietinus, A. trifasciatus, Symmorphus mutinensis, Crossocerus annulipes, C. dimidiatus, Oxybelus uniglumis, Pemphredon lethifer, P. lugubris, Mellinus arvensis, Nysson spinosus, Argogorytes mystaceous, Hylaeus communis, Andrena fucata, A. minutula, Sphecodes gibbus, S. puncticeps, Megachile willughbiella.*	21
24	2	*Dipogon variegatus, Anoplius nigerrimus, Odynerus spinipes Ancistrocerus parietum, Crossocerus tarsatus, Ectemnius cavifrons, Entomognathus brevis, Pemphredon inornatus, Lasioglossum albipes, L. rufitarse, L. leucopum, Nomada fabriciana.*	12
21	3	*Chrysis angustula, Trypoxylon attenuatum, C. pusillus (= varus), Hylaeus hyalinatus, Andrena fulva, Nomada flavoguttata, N. panzeri.*	7
16	4	*Arachnospila spissa, Nomada goodeniana, N. marshamella, N. ruficornis.*	4
20	5	*Arachnospila anceps, Tachysphex pompiliformis, Andrena saundersella, Lasioglossum villosulum.*	4
30	6	*Andrena subopaca, Lasioglossum cupromicans, Sphecodes fasciatus, S. hyalinatus, S. monilicornis.*	5
14	7	*Priocnemis perburbator, Andrena nigroaenea.*	2
8	8	*Lasioglossum calceatum*	1
45	9	*Andrena chrysosceles, A. haemorrhoa, A. scotica, Halictus rubicundus, H. tumulorum.*	5
10	10	*Lasioglossum fulvicorne*	1
11	11	*Lasioglossum fratellum*	1
14	14	*Andrena bicolor*	1

The size of the quality scores is of a magnitude expected from the areas of the localities (Archer, 1995). This relationship is a reflection of a species-area relationship, where the larger the area of the locality the more species are present, including an increased chance of nationally scarce and rare species being found.

Because the quality scores are so related to the areas of the localities, two further comments can be made. Firstly, the species list for each locality is probably more-or-less complete (Archer, 1996b). Secondly, species diversity, or the number of species, of the two calcareous localities, are comparable to the species diversity of sandy localities (Archer, 1995). Traditionally sandy localities have been considered to have a higher species diversity than calcareous localities. The evidence from Burton Leonard and Cave Wold would indicate this traditional expectation may not be correct. However species lists from larger calcareous localities and from southern parts of England and Wales are required to investigate the validity of this traditional expectation further.

There is some evidence (Archer, 1996c) that species quality scores, unlike quality scores, are independent of the areas of localities so allowing direct comparisons between localities of different areas. As such, the species quality scores of Burton Leonard are similar to those of Skipwith Common (Archer, 1995). The species quality scores of Cave Wold are the

lowest scores so far published, but are similar to those of Askham Bog (based on Archer, 1987; regional species quality score = 1.7; national species quality score = 1.3).

TABLE 4
The number species and new species of solitary wasps and bees recorded per month at Burton Leonard Lime Quarries (BL) and Cave Wold (CW).

	April		May		June		July		Aug.		Sep.	
	BL	CW	BL	CW	BL	CW	BL	CW	BL	CW	BL	CW
No. species												
Solitary wasps	0	1	1	4	19	14	21	18	7	7	0	–
Solitary bees	11	9	20	17	19	25	13	18	11	16	3	–
No. new species												
Solitary wasps	0	1	1	3	18	11	10	14	1	1	0	–
Solitary bees	11	9	12	10	7	8	0	5	1	2	0	–

TABLE 5
The regional quality scores of the species of solitary wasps and bees recorded at Burton Leonard Lime Quarries (BL) and Cave Wold (CW).

Status	Status value (A)	No. species BL(B)	No. species CW(B)	Quality score BL(AxB)	Quality score CW(AxB)
Common	1	37	38	37	38
Frequent	2	13	19	26	38
Occasional	4	8	6	32	24
Rare	8	0	1	0	8
Nationally scarce	16	3	0	48	0

TABLE 6
The Archer national quality score of the species of solitary wasps and bees recorded at Burton Leonard Lime Quarries (BL) and Cave Wold (CW).

Status	Status value (A)	No. species BL(B)	No. species CW(B)	Quality score BL(AxB)	Quality score CW(AxB)
Universal	1	42	52	42	52
Widespread	2	16	12	32	24
Restricted	4	0	0	0	0
Scarce B	8	3	0	24	0

Cleptoparasitic Load

The cleptoparasitic load (CL) is the percentage of aculeate species that are cleptoparasites (or parasitoids) on other host aculeates. A more-or-less complete list of species in a locality should be made before the CL is calculated in order to avoid bias towards either host or cleptoparasitic species. Since the species lists for Burton Leonard and Cave Wold probably are more-or-less complete, CLs can be calculated. The CLs for the species of solitary bees are higher than the CLs for the species of solitary wasps (Table 7). These CLs are similar to values from other localities (Archer, 1996d).

Aerial Nester Frequency

The aerial nester frequency (AF) is the percentage of host aculeate species that have aerial nest sites. Again a more-or-less complete list of species in a locality should be made before the AF is calculated to avoid possible bias towards either aerial or subterranean nesters.

TABLE 7

The relative frequency of the cleptoparasitic species among the solitary wasps and bees from Burton Leonard Lime Quarries (BL) and Cave Wold (CW).

	No. hosts (H)		No. cleptoparasites (C)		Cleptoparasitic load CL=100xC/(H+C)	
	BL	CW	BL	CW	BL	CW
Solitary wasps	25	25	5	5	16.7	16.7
Solitary bees	23	23	8	11	25.8	32.4

At Burton Leonard, underground nest sites are associated with bare patches in the grassland, bare banks at the sides of paths, and on cliff exposures and path surfaces. Some of the path surfaces were the relicts of motor-cycle activity. At Cave Wold there are many bare banks in sunny situations, but the most important is the steep south-facing bank of the railway cutting. At the top of this bank the soil is particularly friable and easy to excavate.

The aerial nest sites are associated with dead plant stems, e.g. bramble, at both localities. At Burton Leonard remains of dead tree stumps in sunny situations also were used. At Cave Wold the dead wood remains from old posts and fencing in sunny situations was valuable.

The AFs for the species of solitary wasps are higher than the AFs for the species of solitary bees (Table 8). The AFs for the solitary bees from both localities are very similar to the British Isles value of 19.0%.

TABLE 8

The relative frequency of the cleptoparasitic species among the solitary wasps and bees from Burton Leonard Lime Quarries (BL) and Cave Wold (CW).

	No. aerial nesters (A)		No. subterranean nesters (S)		Aerial nester frequency AF=100xA/(A+S)	
	BL	CW	BL	CW	BL	CW
Solitary wasps	17	14	8	11	68.0	56.0
Solitary bees	3	3	20	20	13.0	13.0

The AF for the solitary wasps from Burton Leonard is much higher than the British Isles value of 44.9%. This high value probably is a consequence of the relative lack of friable soils which is also the case at Duncombe Park (Archer, 1993b). The AF for the solitary wasps from Cave Wold is more similar to the British Isles value and is nearly the same as that from the sandy locality of Shipley Glen (value should be 56.6%, not 44.4% as printed; Archer, 1996a). The friable soil of the steep south-facing bank at Cave Wold must account for the relatively increased number of subterranean nesters.

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CORRECTION

Regrettably the photographic plate of the snipe which appeared in *The Naturalist* **122**: 32 (1997) was attributed to J. Vaughan, but I am sure readers will have recognised it as the work of Richard Vaughan, a regular contributor of superb photographs of bird studies.

Editor

LATEGLACIAL AND POSTGLACIAL MOSS RECORDS FROM A VALLEY BOG, SNIDDLE MOSS, IN THE INGLEBOROUGH REGION

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The Ingleborough Region of the Craven District, West Yorkshire, is dominated by limestone features and has various types of peat deposits. Although there have been earlier palaeobotanical studies of several mires (Gosden, 1965; Swales, 1987), they have provided little evidence of mosses. Sniddle Moss (NGR SD 707 695), a valley bog, lying in the heart of drift material in the south, near Clapham, has revealed a vegetational succession from the Lateglacial Period (*c.* 13,000-10,000 BP) onwards (Oybak, 1993). Macrofossil analyses have yielded a wide variety of moss species. A reconstruction of the hydroseral succession based on stratigraphy, macro- and microfossil analyses suggests that mosses have played an important part in the vegetation of the site from the Lateglacial Period through to the present day.

The stratigraphy was established through systematic borings along a transect across the bog as shown in Figure 1. It indicates development from a lake through swamp and fen carr to bog-heathland communities. Radiocarbon dates have been obtained for a number of Postglacial levels of the pollen sites, SM4 and SM9. Since the Lateglacial deposits are rich in calcium carbonate, they could not be dated. Therefore, the Lateglacial vegetation phases are correlated with the proposed climatostratigraphic scheme of Lowe and Gray (1980). Nomenclature of mosses follows Smith (1978) and of vascular plants follows Clapham *et al.* (1989).

Hydroseral Development of Sniddle Moss with Special Reference to Mosses

Lateglacial

On the northern side of the section there is a basic sequence of two lake clays separated by organic layers (nekron mud, marl and clay with organic material). Frequent moss leaf fragments, most of which could not be identified, were recovered from the lower clay, suggesting that at the close of the last major glaciation at about 13,000 years BP immature and base-rich soils around the Sniddle Moss lake were colonized by bryophytes, amongst which *Homalothecium sericeum* and *H. nitens* were present. It seems that erosion was severe and inorganic material along with moss fragments were washed into the lake. It is inferred from the pollen spectra that dry land vegetation in the immediate area must have been very sparse, with grasses and other herbs of open areas, such as Chenopodiaceae, *Helianthemum* and *Saxifraga* spp.

As a more dense vegetation cover developed in the surrounding area with the onset of a further climatic improvement, organic material accumulated in the lake. The macroscopic finds of *Cratoneuron commutatum, Drepanocladus revolvens, Hylocomium splendens* and *Racomitrium* spp show that these taxa were part of the moss layer of the local vegetation during the Interstadial (*c.* 13,000-11,000 years BP).

The upper lake clay is likely to indicate temporary retardation of the hydroseral development under much colder climatic conditions during the Younger Dryas Period (*c.* 11,000-10,500 BP). *Calliergon giganteum, Drepanocladus exannulatus, D. fluitans/ D. exannulatus* and *Scorpidium scorpioides* leaves first appear in the upper clay and are especially more abundant at sampling points near the edges of the former lake. These aquatic "brown mosses" may have dominated the margins of the Sniddle Moss lake. Dickson (1973) records the above-mentioned taxa as being among the most frequently encountered species from Lateglacial sites (Godwin zones II and III) in Britain. A similar assemblage of species in Lateglacial/early Postglacial deposits is also shown from other parts of Europe and North America (Vitt & Kuhry, 1992).

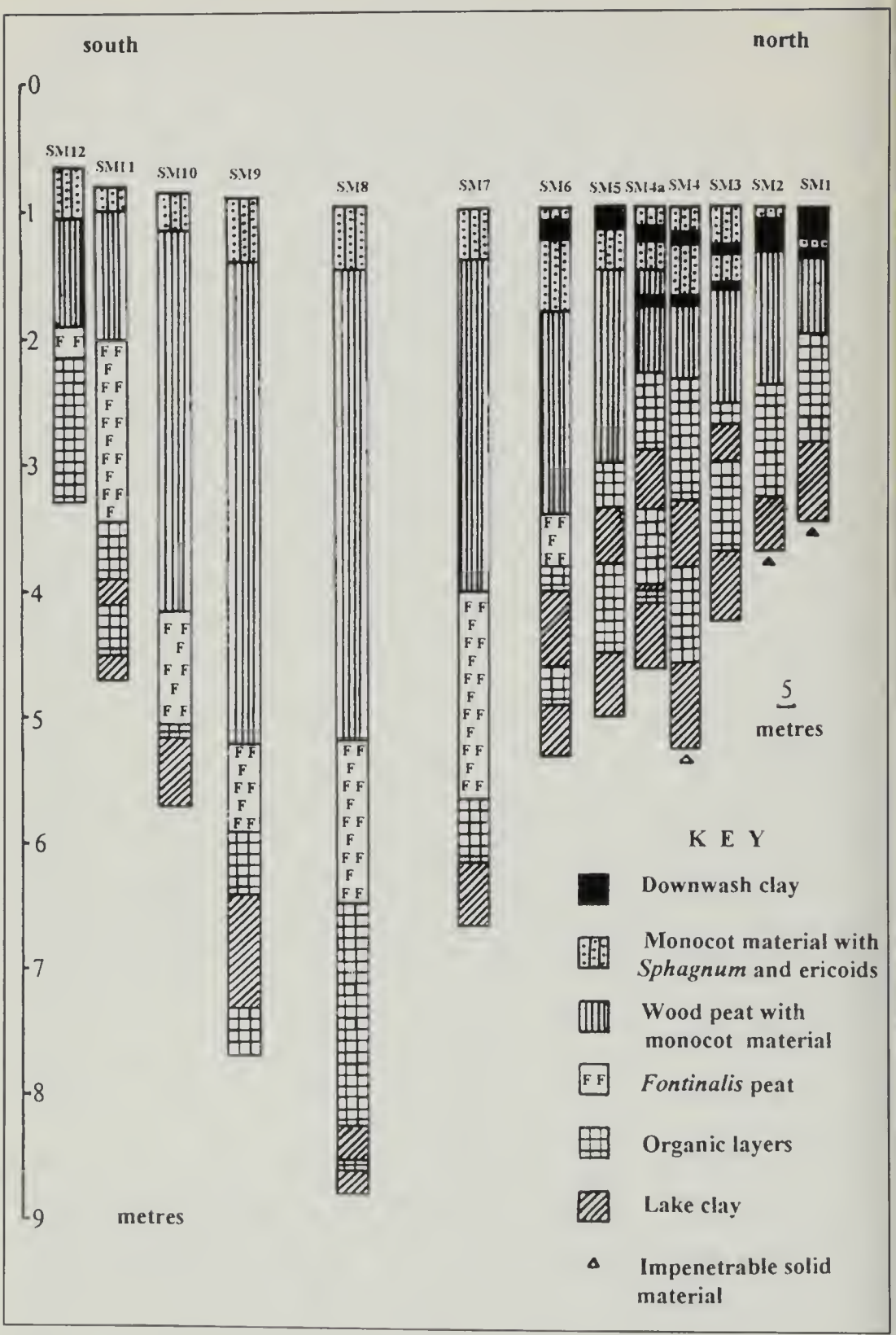

FIGURE 1
Stratigraphy across Sniddle Moss (SM4a is closer to SM4 than it is shown in the figure).

Postglacial

The deposits overlying the lake clay are made up of fragments of a fen/swamp vegetation. A return to warmer climatic conditions in the beginning of the Flandrian resulted in deposition of organic material and expansion of thermophilous taxa on the site. The nature of the moss flora appears to have changed at this time. The occurrence of *Antitrichia curtipendula, Eurhynchium praelongum, Hypnum cupressiforme* agg., ?*Leskea polycarpa* and *Rhynchostegium confertum* could be related to the principal trees of the early Postglacial, *Betula pendula, B. pubescens* and *Populus tremula*, whose local presence was ascertained by the finds of macroscopic remains. These shade-tolerant moss taxa could have grown on the tree bases. In the lake the stratigraphy indicates that *Fontinalis antipyretica* spread from the southern side towards the middle of the lake but it did not colonize the northern side. *Calliergon giganteum, Amblystegium* ? *riparium, A. varium* and *Sphagna* (*S.* Sect. *Acutifolia* and *S.* Sect. *Cuspidata*) were present, probably in damp areas of the site.

Later (*c.* 7300 BP), as the surface of the mire became drier, possibly as a result of terrestralization, *Alnus glutinosa* became established and there was an expansion of fen and fen carr species such as *Angelica sylvestris, Cicuta virosa, Eupatorium cannabinum, Rumex hydrolapathum* and *Solanum dulcamara*. The shade-tolerant components of the moss flora survived, whereas *Fontinalis antipyretica* completely disappeared. *Calliergon giganteum* was replaced by *C. cuspidatum* in this phase. *Bryum* sp., *Bryum* sp./*Mnium* sp., *Dicranella schreberana, Neckera complanata, N. pumila, Dicranum scoparium, D.* ? *fuscescens, Plagiomnium* ? *affine, Thuidium tamariscinum* and *Zygodon viridissimus* were also found, probably growing on the tree trunks and bases.

Towards the top of the profile the occurrence of *Sphagnum papillosum* in combination with species of bog-heathland (e.g., *Erica tetralix, Calluna vulgaris* and *Aulacomnium palustre* and other *Sphagna*) illustrates oligotrophic conditions on the site. This last phase of hydroseral succession coincides with massive deforestation in the surrounding area.

Today the moss flora of the bog consists mainly of low hummocks of *Sphagna* – *S. magellanicum* and *S. papillosum* – with *Aulacomnium palustre, Polytrichum commune, Calliergon cuspidatum, C. stramineum* and some *Rhytidiadelphus squarrosus*, in association with *Carex* species, *C. curta, C. nigra, C. panicea* and *C. rostrata*, and *Eriophorum angustifolium*.

It is interesting that all the fossil mosses grow quite commonly in the Ingleborough area today except *Homalothecium nitens*, though it is found at Malham. This is perhaps a reflection of the diversity of habitats found in the area today, from the relatively mild lowlands to the severe conditions of Ingleborough itself.

Acknowledgements

We are indebted to Dr J. H. Dickson for giving advice and for identifying *Zygodon viridissimus*. Thanks are due to Mr Tom Blockeel for his comments on indeterminable specimens, and Prof. H. J. B. Birks for helpful comments.

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BOOK REVIEW

Ants by **Gary J. Skinner** and **Geoffrey W. Allen**. Pp. 84. Naturalists' Handbooks No. 24, Richmond Publishing Co., Slough. 1996. £15.00 hardback, £8.95 paperback.

This pocket sized handbook is a useful addition to the Naturalists' series. The illustrations by Geoffrey Allen are fine and keys to workers, queens and males of the British species adequate and well illustrated with appropriate line drawings. There are four main sections: introduction, biology, identification and techniques. In his extensive chapter on biology the senior author Gary Skinner suggests many practical ways in which ant behaviour can be studied, including exploratory work on feeding, trail finding and foraging strategies.

There are a few minor misleading statements and evidently K. E. J. Barrett's 1979 *Atlas* has not been carefully studied: for example, page 17 "*Formica cunicularia* not found further north than Cambridge". In fact this species flourishes on drift calcareous sand in South Lincolnshire about 75 miles north; *F. candida* is still present in the New Forest as well as Dorset; *Lasius fuliginosus* has occurred in hedges in North Lincolnshire. In the Biology section, *Formica rufa* is described as monogynous, wheras all colonies from the Midlands to Surrey are polygynous. In Britain, this species has only been documented twice as a temporary social parasite of *F. fusca*. In Europe, *F. rufa* occurs more frequently in monogynous colonies and behaves as a separate species although individual workers are not morphologically separable. *F. lugubris* has probably never been found in association with *F. fusca* in the British Isles although this species commonly occurs with the northern sister species, *F. lemani*, in Scandinavia.

Although the authors sensibly point out in the introduction to the section on identification that nomenclature is still in a somewhat fluid state, a word of explanation for such names as *Myrmica bessarabica* for *M. speciodes* and *Formica candida* for the long known *F. transkaucasica* would have been helpful. The reference section is somewhat overburdened with names but those strictly relevant to the British fauna such as the differentiation between the two British *Stenamma* (Dubois, 1993) and the seminal work of I. H. H. Yarrow (1954, 1955) on the British *Formica* species among others have been omitted. Despite these minor criticisms this is a comprehensive, practical and compact guide with many useful suggestions for observational studies.

CC

PROGRESS IN THE STUDY OF THE YORKSHIRE LICHEN FLORA – 2

M. R. D. SEAWARD

Nine years have elapsed since the first progress maps relating to the study of the Yorkshire lichen flora were prepared (Seaward 1987, fig. 6), during which time the number of 10km x 10km grid records has increased by 54.6%, currently representing *c.*108 records per square; many of these records have been assembled over the past four years as a consequence of the British Lichen Society's churchyard survey of England, a major proportion of the Yorkshire records being compiled by D. H. Smith. A significant number of records have also been made by A. Henderson and the author as part of their detailed study of the West Yorkshire conurbation (Seaward & Henderson 1991, Seaward *et al.* 1994) and as a result of their attendance at YNU field meetings, some floras receiving special attention (eg. Seaward & Henderson 1994); further records were supplied by numerous field workers in connection with the on-going publication of *Lichen Atlases* (Seaward 1995-6), including re-appraisal of herbarium material and published records. Further progress maps relating to the Yorkshire lichen flora are to be found in Seaward (1989, 1991, 1993, 1994).

In December 1996 there were 21,103 post-1960 and 2820 pre-1960 lichen records for Yorkshire on the author's computer database, their distribution frequencies shown in

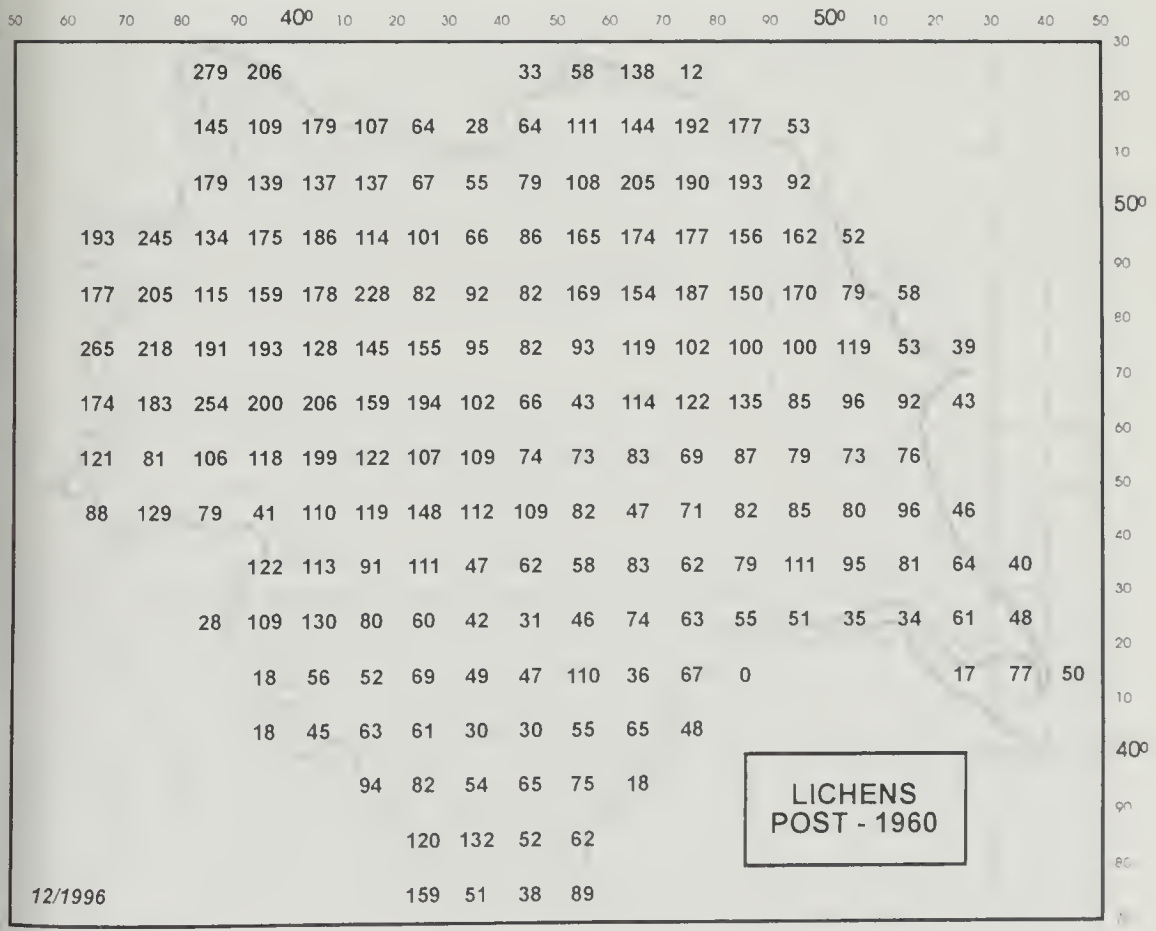

FIGURE 1

Number of lichen taxa recorded from each Yorkshire 10km x 10km square since 1960. (NB. Border squares may contain a few records pertaining to the neighbouring county.)

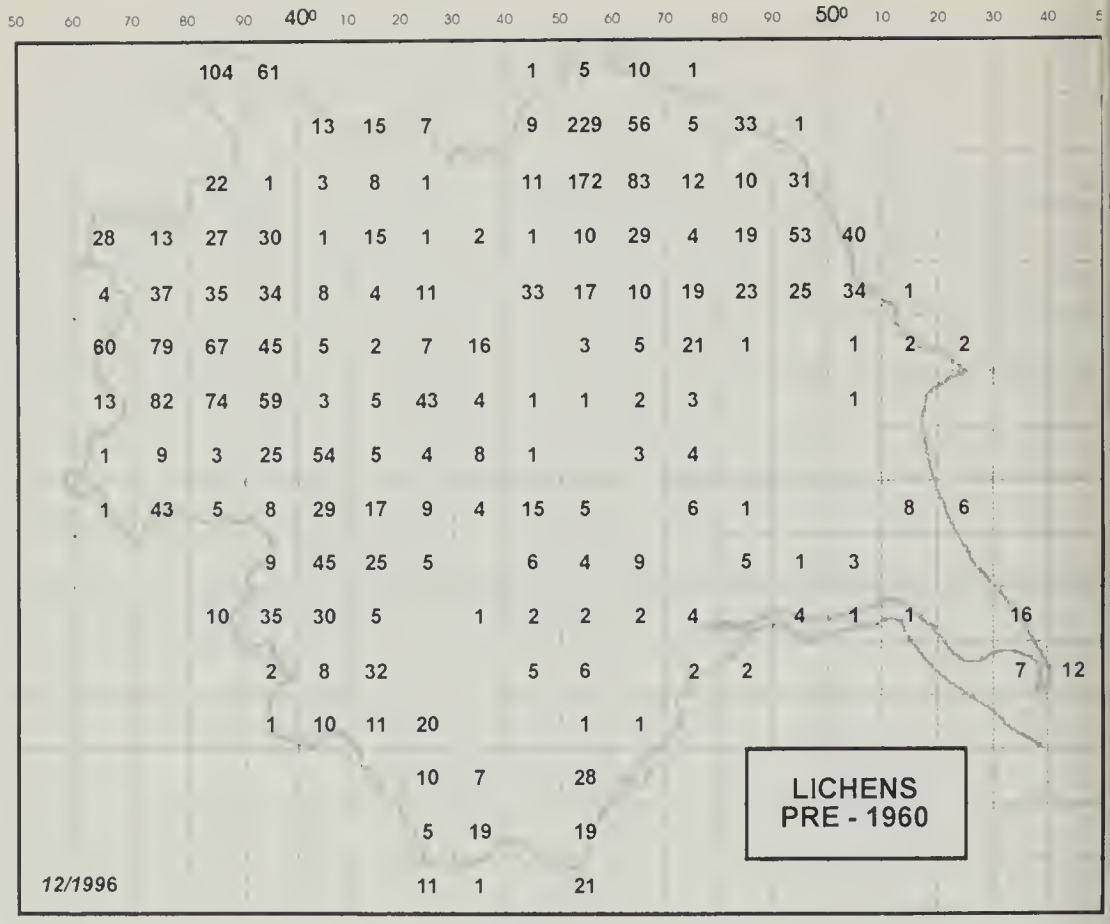

FIGURE 2
Number of lichen taxa recorded from each Yorkshire 10km x 10km square prior to 1960.

Figures 1 and 2 respectively. The overall patterns continue to demonstrate the dramatic effects of air pollution, but some of the previous lacunae (cg. Seaward 1993) are less obvious due to the contribution of records from the churchyard survey and to the more pronounced effects of hyper-(eu-)trophication resulting from various agricultural practices which often raise biodiversity.

Although several species have been rediscovered in the county, some of which are undoubtedly reinvasions consequent upon atmospheric amelioration, there are still 2820 pre-1960 records (Figure 2); most of these records relate to William Mudd's 1860s work in the Cleveland area and to many others working in Teesdale and the Yorkshire Dales (Seaward 1987).

The Yorkshire lichen flora can now be summarized as follows: 810 taxa (787 species, 3 subspecies, 16 varieties and 4 forms) have been recorded from the county over the past 300 years, of which 130 are based on old records, the great majority presumed extinct since they have not been seen for a century or more; of the 679 extant taxa, 250 have been discovered since 1956. There have been 12 new taxa discovered in the county since the most recently published checklist (Seaward 1994):

Bacidia fuscoviridis (Anzi) Lettau
Cladonia polydactyla var. *umbricola* (Tonsb.& Ahti) Coppins
Gyalidea lecideopsis (Massal.) Lettau ex Vezda
Lepraria rigidula (Hue) Tonsb.

Leptogium massiliense Nyl.
Porpidia flavocaerulescens (Hornem.) Hertel & Schwab
Pterygiopsis coracodiza (Nyl.) Henssen
P. lacustris P. M. Jorg.& R. Sant.
Pyrenocollema caesium (Nyl.) R. Harris
Staurothele succedens (Rehm ex Arnold) Arnold
Thelidium fontigenum Massal.
T. pluvium A. Orange

There has also been one rediscovery, *Lecidella asema* (Nyl.) Knoph & Hertel, and two additional older records of *Cladonia borealis* Stenr. and *Peltigera britannica* (Gyelnik) Holt.-Hartw. & Tonsb. made as a consequence of the re-examination of herbarium material.

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BOOK REVIEW

The Hymenoptera, edited by **Ian Gauld** and **Barry Bolton**. Pp. 332, with 10 colour plates, 148 figures. Oxford University Press, 1996. £37.50 hardback.

Except for the covers this book is a reprint of the 1988 edition and gives an excellent introduction to the Hymenoptera with an emphasis on the British fauna. Introductory chapters deal with life-cycles including the parasitoid lifeways and the development of sociality; economic importance as pests, biological control agents and pollinators; practical aspects of collecting, rearing and the preservation of specimens; morphology of adults and larvae; and higher classification. The remaining chapters deal with each superfamily under the three tradional groups of sawflies, parasitoids and aculeates. For the British fauna keys are given to the family level. At the family level information is given on the number of species, life-histories and references to identification keys to the species level. For large families a synopsis of subfamilies is given. The colour plates show a slight loss of quality compared with the original edition. The text is well supported by line drawings, including many whole insects representing family examples, by David Morgan. This is a book that can be highly recommended.

MEA

TWO RECENTLY DESCRIBED FLIES IN YORKSHIRE: *PLATYPALPUS AUSTRALOMINUTUS* GROOTAERT (DIPTERA:HYBOTIDAE) AND *HERCOSTOMUS SILVESTRIS* POLLET (DIPTERA:DOLICHOPODIDAE)

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Grootaert (1989) described *Platypalpus australominutus*, which is distinguished from the closely allied *P. minutus* (Mg.) on the basis of clear differences in the structure of the male genitalia; the female of the new species is not described. Both species are easily separated from other members of the genus by the presence of a projecting lip at the apices of the front tibiae.

In Britain, *P. minutus* is a common species and it is widely distributed across Yorkshire. Grootaert (1989) notes that *P. australominutus* is usually found in low quantities among *P. minutus* and it is present in the same biotopes. Specimens from the collection of the British Museum (Nat. Hist.), (now the Natural History Museum), examined by Dr Grootaert in the course of his research revealed that *P. australominutus* is present in Britain, the earliest noted example being from Berkshire in 1881.

I have examined specimens standing under *'minutus'* in my own collection and all those collected by me subsequent to the receipt of Dr Grootaert's paper, and I am able to report that *P. australominutus* is widespread in the York area, including the Lower Derwent Valley and Bishop Wilton; I also have a record from Staveley Lagoons Nature Reserve near Boroughbridge. Mr J. D. Coldwell has found it at two localities in the Barnsley area and I have no doubt that it will prove to be widely distributed across Yorkshire, often with *P. minutus* but perhaps in smaller numbers. In the light of these recent discoveries all records of *P. minutus* prior to 1989 should be treated as suspect if voucher specimens are not available for study, as they may refer to either species.

In a review of the genus *Hercostomus*, Pollet (1990) described a new species, *H. silvestris*, which is closely similar to *H. assimilis* (Staeg.). The differences occur in the colour of the femora and hind tibiae, and in the shape and colour of the male genital processes.

H. assimilis is locally distributed in Yorkshire, all but one record being from the east or south-east of the county, mostly in wet woodland or marshes. No examples of *H. silvestris* have been found in my own collection standing under *'assimilis'*, but on 16 July 1996 I took two male specimens of *H. silvestris* at Low Wood, Hornsea (TA/14) which is the first fully documented occurence of the new species in Yorkshire. (There is a single male specimen in the collection of the Natural History Museum labelled 'Yorkshire (marsh) 5.vi.1909, J. H. Wood'; see Pollet (1990a). Dr Wood lived in Herefordshire and he was a prominent dipterist of the time whose collecting was mainly done in the Monnow Valley.) Since publication of Dr Pollet's papers *H. silvestris* has been noted by myself and colleagues in several widespread localities in England, so its occurence in Yorkshire was not unexpected.

I am obliged to Dr P. Grootaert and Dr M. Pollet for copies of their papers.

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BOTANICAL REPORT FOR 1996
FLOWERING PLANTS AND FERNS

Compiled by D. R. GRANT
19 The Wheatings, Ossett, West Yorkshire WF5 0QQ

The Recorders thank all those who have sent records, their names are given in full the first time they appear in the VC report, initials being used thereafter. Nomenclature is according to Kent, D. H. (1992) *List of vascular plants of the British Isles.*

EAST YORKSHIRE (VC61) (F. E. Crackles)

*denotes a first vice-county record.

Oreopteris limbosperum (Bellardi ex All.) Holub Wheldrake Woods 44/64; M. Hammond. Confirming a 1956 record.

Ranunculus parviflorus L. Disturbed sand, Haverfield Quarry Nature Reserve 54/32; W. R. Dolling.

Chelidonium majus L. In old pit near Warter 44/85; A. J. Horne.

Claytonia perfoliata Donn ex Willd. Near golf course, Brough 44/92; G. R. Morrell, confirming a 1939 record.

Spergularia marina (L.) Griseb. Along the A63 in 44/92 and 54/02; R. A. Eades.

Rumex crispus x *R. obtusifolius* = *R.* x *pratensis* Mert. & Koch Bishop Burton pond 44/93; K. Glover, detd. T. F. Medd. 2nd VC record.

Viola palustris L. Wheldrake Woods 44/64; M. H., confirming a 1836 record.

Cochlearia danica L. Spreading along salted 'A' class and some minor roads, noted in 54/04; R. Middleton & J. Dews, 44/62, 44/83, 44/93, 44/95, 54/05, 54/06, 54/07, 54/14, 54/16; P. J. Cook. Also in 44/82; R.A.E. and 54/03; J.D.

Vaccinium myrtillus L. Wheldrake Woods 44/64; M.H., A rare VC61 species.

Rubus nemoralis P. J. Mueller Near Dunnington 44/65; D. R. Grant.

Rubus eboracensis W. C. R. Watson Near Dunnington 44/65; D.R.G.

Agrimonia procera Wallr. Plentiful on rides in Hagg Wood, Dunnington 44/65; M.H. The only extant VC locality.

Trifolium micranthum Viv. Sandy roadside verge, West Knapton 44/87; M.H.

Daphne laureola L. Brough 44/92; G.R.M.

Petroselinum segetum (L.) Koch In quantity at the edge of arable, by Haverfield Quarry Nature Reserve 54/32; P.J.C. A significant record.

Sison amomum L. On dyke spoil, Patrington Haven 54/32; P.J.C.

Torilis nodosa (L.) Gaertner On the riverside of the Humber bank from Brough 44/92 to Crabley Creek and on to Broomfleet 44/82; R.A.E. Swine Moor 54/04; A. Marshall. On eroded chalk scree at Butterwick Whins 54/07, 1995; M.H. At edge of arable by Haverfield Quarry Nature Reserve with Petroselinum segetum 54/32; P.J.C.

Stachys palustris x *S. sylvatica* = S. x ambigua Smith Hagg Wood, Dunnington 44/65; M.H.

Salvia verbenaca L. Road bank, Weaverthorpe 44/97, 1995; M.H.

Orobanche hederae Duby On Ivy in two gardens in Keyingham 54/22; A. Braithwaite. Not deliberately introduced, but occurrence may be connected with attempts to grow the species in the Botanic Gardens of the University of Hull some years ago.

Adoxa moschatellina L. The Rush, Scrayingham 44/76, 1995; M.H.

Hieracium diaphanum Fries Langwith Common 44/64 and Warter 44/84; P.J.C., detd. D. McCosh.

Baldellia ranunculoides (L.) Parl. Tophill Low 54/04; A.M.

Ruppia maritima L. fruiting unusually well in Fisherman's Channel, Sunk Island 54/21; P.J.C.

Luzula pilosa (L.) Willd. Moreby Wood, Escrick 44/64; M.H.

Eleocharis uniglumis (Link) Schultes By pond, Dunnington 44/65; P.J.C., confd. F. E. Crackles.

Carex sylvatica Hudson With other woodland indicators e.g. Circaea lutetiana in Dove Lane, Roos 54/22; P.J.C. This species is rare in Holderness, east of the River Hull valley.

Melica uniflora Retz. Moreby Wood, Escrick 44/64; M.H.

**Elytrigia repens* subsp. *arenosa* (Spenner) A. Love (Formerly *Agropyron maritimum* (Loch & Ziz) Janesen & Wachter, non (L.) P. Beauv. with few U.K. records. First on Haverfield Quarry Nature Reserve 54/32 (detd. by T. A. Cope) and subsequently in large quantity at Welwick Bushes 54/31 and along Spurn 54/41; P.J.C.

Epipactis helleborine (L.) Crantz Moreby Wood, Escrick 44/64; M.H.

Nettia nidus-avis (L.) Rich. Moreby Wood, Escrick 44/64; M.H. The only extant locality.

NORTH-EAST YORKSHIRE (VC62) (T. F. Medd)

Lycopodium clavatum L. High Blakey Moor 44/69; K. Trewren: Greenhow Plantation 45/50; V. Jones.

Huperzia selago (L.) Bernh. Farndale Head (3 plants) 45/60; K.T.& V.J.

Equisetum hyemale L. Cow Close Wood, Moorsholm 45/61; I. C. Lawrence: Mill Bank Wood 45/71 and Rigg Mill Wood 45/90; K.T.

Ophioglossum vulgatum L. Thornton Stud 44/38; YNU Bot. Sec. Excn.

Polypodium interjectum x *vulgare* = *P.* x *mantoniae* Rothm. & U. Schneider Near Hawnby 44/58: Danby and Arnecliff Woods 45/70; near Aislaby 45/80; all K.T. det. A. C. Jermy.

P. interjectum Shivas Byland Abbey 44/57; Helmsley Castle 44/68; Kilton Woods 45/71; Runswick Bay 45/81; Rigg Mill Wood 45/90; K.T.

Phegopteris connectilis (Michaux) Watt Farndale 44/69 and Helwath Beck 44/99; K.T.

Asplenium trichomanes-ramosum L. Stoney Gill Hole 44/59; K.T.

Gymnocarpium dryopteris (L.) Newman Tripsdale 44/59 and Hackness 44/99; K.T.

**Polystichum aculeatum* x *setiferum* = *P. bicknellii* (Christ) Hahne Raven's Gill, Flassen Gill and Whitestone Cliff 44/58; Forge Valley 44/98; Hackness 44/99; Millholme Beck and Hagg Beck Wood 45/61; Stonegate Gill (new VC record in 1995 det. A. C. Jermy), W. Arncliff Wood, Limber Hill Wood and Crunkly Gill 45/70; Skate Beck and Dales Beck 45/71; Dorsley Bank Wood and near Littlebeck 45/80, Cock Mill Wood 45/90; all K.T.

Dryopteris aemula (Aiton) Kuntze Wheeldale Gill 44/79 and Scar Wood 44/99; K.T. Barnscliff and Langdale Rigg 44/99; K.T. and C. Wilson: Hayburn Beck 54/09; K.T.

D. carthusiana x *dilatata* = *D. deweveri* (J. Jensen) Wachter Scar Wood 44/99 Stonegate Gill 45/70 and Lythe Bank 45/80; K.T. det. A. C. Jermy

Aconitum napellus L. Stape 44/79; A. L. & R. M. Bull.

Ceratocapnos claviculata (L.) Liden Yearsley 44/57; YNU Excn.

Chenopodium bonus-henricus L. East Ness 44/67; T.F.M.

Stellaria pallida (Dumort.) Crepin South Gare to Marske 45/52 and 45/62; I.C.L.

Myosoton aquaticum (L.) Moench Lockwood Beck reservoir 45/61; I.C.L.

Sagina nodosa (L.) Fenzl Glaisdale 45/70; J. Killick.

Hypericum androsaemum L. Birkwath Beck 45/70; J.K.

Arabidopsis thaliana (L.) Heynh. Huby 44/56; T.F.M.

Rorippa sylvestris (L.) Besser By R. Tees, Girsby 45/30; BSBI Excn. and D. R. Grant & T. Schofield.

Cochiearia danica L. Acklam 45/41 and Stokesley 45/50; I.C.L.

Coronopus squamatus (Forsskal) Asch. Yearsley 44/57; YNU Excn.

Pyrola minor L. Whitecliff Wood 45/71; I.C.L.

Lysimachia vulgaris L. By R. Tees, Girsby 45/30; BSBI Excn. and D.R.G. & T.S. Nunthorpe 45/51; I.C.L.

Sedum telephium L. Stape 44/79; A.L. & R.M.B.

Rubus scissus W. C. R. Watson Girsby Scar 45/30; D.R.G. & T.S.
R. lindleianus Lees Yearsley 44/57; YNU Excn.
R. ulmifolius Schott Girsby Scar 45/30; D.R.G. & T.S.
R. ulmifolius Schott x *vestitus* Weihe Kirkdale 44/68; A.L. & R.M.B.
R. auisacanthos G. Braun Stape 44/79; A.L. & R.M.B.
R. echinatoides (Rogers) Dallman Yearsley 44/57; YNU Excn. Kirkdale 44/68; A.L. & R.M.B.
R. pedemontanus Pinkw. Stape 44/79 and Goathland 45/80; A.L. & R.M.B.
R. pruinosus Arrh. Stape 44/79; A.L. & R.M.B.
Rosa rugosa Thunb. ex Murray Stape 44/79; A.L. & R.M.B.
R. nodilis Smith Stape 44/79; A.L. & R.M.B.
Lathyrus nissolia L. Acklam 45/41; I.C.L.
Trifolium micranthum Viv. Strensall Common 44/65; M. Hammond. Confirmation of a pre-1930 record in the Atlas.
Myriophyllum spicatum L. Girsby Scar 45/30; D.R.G. & T.S.
M. alterniflorum DC. Scaling Dam and Waupley Moor 45/71; I.C.L.
Lythrum portula (L.) D. Webb Waupley Moor 45/71; I.C.L.
Epilobium ciliatum Raf. x *roseum* Schreber Middlesbrough 45/41 and 45/42; I.C.L.
Rhamnus cathartica L. Little Park Wood, Pickering 44/88; M.H.
Geranium pyrenaicum Burman f. Redcar 45/62; I.C.L.
G. pusillum L. Redcar 45/62 and near Scaling Dam 45/71; I.C.L.
Scandix pecten-veneris L. Lythe 45/81; Mrs P. Wood – probably the first record for the VC since 1960.
Berula erecta (Hudson) Cov. Yedingham 44/87; M.H. Pinchinthorpe 45/51; I.C.L.
Apium inundatum (L.) Reichb. f. Sutton-on-the-Forest 44/56; T.F.M. Waupley Moor 45/71; I.C.L.
Heracleum mantegazzianum Sommier & Levier Banks of R. Tees, Girsby 45/30; BSBI Excn. and D.R.G. & T.S.
Polemonium caeruleum L. Wilton Heights quarry (one plant) 44/88; M.H.
Clinopodium vulgare L. Girsby Scar 45/30; D.R.G. & T.S.
Origanum vulgare L. Sutton-on-the-Forest 44/56; T.F.M.
Callitriche brutia Petagna New pond, Pinchinthorpe 45/51; I.C.L.
Scrophularia umbrosa Dumort. R. Foss, Strensall 44/66; M.H.
Mimulus guttatus DC. By R. Tees, Girsby 45/30; BSBI Excn. and D.R.G. & T.S.
Veronica polita Fries Marske 45/62; I.C.L.
Carlina vulgaris L. Girsby Scar 45/30; D.R.G. & T.S.
Picris echioides L. Strensall (?introduced with grass seed) 44/66; T.F.M.
Lactuca serriola L. Hemlington and Thornaby 45/41; I.C.L.
L. virosa L. South Holme 44/67; T.F.M. Guisborough 45/61; I.C.L.
Eupatorium cannabinum L. Thornton Stud 44/38; YNU Bot. Sec. Excn.
Butomus umbellatus L. Howsham Bridge 44/76; T.F.M.
Potamogeton lucens L. Thornton Stud 44/38; YNU Bot. Sec. Excn.
P. perfoliatus L. Lockwood Beck reservoir 45/61; I.C.L.
Juncus tenuis Willd. Eston Moor 45/51; I.C.L.
Eleogiton fluitans (L.) Link Waupley Moor 45/71; I.C.L.
Cyperus longus L. Gunnergate Lake, Marton 45/51; I.C.L.
Poa humilis Ehrh. ex Hoffm. Stape 44/79; A.L. & R.M.B.
Hordelymus europaeus (L.) Jessen Wilton Woods 44/51; I.C.L. Kingthorpe, Pickering 44/88; M.H.
Polygonatum multiflorum (L.) All. Kingthorpe, Pickering 44/88; M.H.
Paris quadrifolia L. Kilton Woods 45/61; I.C.L.
Ornithogalum angustifolium Boreau Sutton-on-the-Forest and Huby 44/56; T.F.M.
Allium scorodoprasum L. Banks of R. Derwent, Old Malton 44/87; M.H.
Iris foetidissima L. Thornton Stud 44/38; YNU Bot. Sec. Excn.

SOUTH-WEST YORKSHIRE (VC63) (D. R. Grant)

Azolla filiculoides Lam. Canal, Colne Bridge, HUDD. SE(44)1720; T. Schofield.
Claytonia sibirica L. Brookhouse, Ogden, HX. SE(44)0629; D. R. Grant.
Rumex hydrolapathum Hudson Denaby Ings Nature Reserve. SE(44)5000; YNU Bot. Sectn. Excn.
Cochlearia danica L. Near the Racecourse, Doncaster. SE(44)5902; D. Bramley.
Primula vulgaris Hudson Near Thurstonland, HUDD. SE(44)1711; J. Lucas.
Rubus accrescens Newton Canal bank, Uppermill. SD(34)9906; D. Earl.
R. scissus W. C. R. Watson Hag Wood, Honley. SE(44)1510; T.S.
R. nemoralis P. J. Mueller Methley Lanes, WFD. SE(44)3725; D.R.G.
R. armeniacus Focke Canal bank, Uppermill. SD(34)9906; D.E.
R. newbouldii Bab. Horbury SE(44)2917; D.R.G., Stanley, WFD. SE(44)3423; D.R.G., Warren Vale, Rotherham. SE(44)4397; D.R.G.
R. infestus Weihe. Scout Dike Resr, Penistone. SE(44)2304; D.R.G.
R. echinatoides (Rogers) Dallman Cockersdale, Tong, BFD. SE(44)2330; T.S., Norwood Green, HX. SE(44)1427; D.R.G., Blackmoor Common, Thurgoland. SE(44)2700; D.R.G.
R. tuberculatus Bab. Canal bank, Uppermill. SD(34)9906; D.E.
R. warrenii Sudre Wombwell Wood, Wombwell. SE(44)3802; D.R.G., Ingbirchworth, SE(44)2305; D.R.G.
R. caesius L. River Bank, Bingley. SE(44)1038; T.S.
Rosa arvensis Hudson Near Farnley Tyas, HUDD. SE(44)1712; J.L.
R. mollis Smith Silkstone Common. SE(44)2804; D.R.G., Oxspring. SE(44)2701; T.S.
R. caesia Smith Tong, BFD. SE(44)2331; T.S.
Prunus padus L. Near Finningley SK(43)6797; T.S.
Ornithopus perpusillus L. Near Finningley SK(43)6798; E. Thompson.
Ononis repens L. Walton Country Park, WFD. SE(44)3618; D.R.G.
Genista tinctoria L. Railway bank, Thurgoland. SE(44)2900; L. Lloyd-Evans.
Anthriscus caucalis M. Bieb. Wickersley. SK(43)4791; J. Newbould.
Pimpinella saxifraga L. Crane Moor, Wortley. SE(44)2901; T.S.
Heracleum mantegazzianum Sommier & Levier Windy Hill, A672/M62 Road Junction. SD(34)9814; E.T.
Myosotis discolor Pers. Langsett. SE(44)1901; L. L-E.
Stachys palustris L. Bierley Hall ponds BFD. SE(44)1729; T.S.
Melampyrum pratense L. Coums Vale, Oughtibridge. SK(43)2993; T.S.
Galium mollugo L. Denaby Ings Nature Reserve. SE(44)4900; YNU Bot. Sectn. Excn.
Petasites albus (L.) Gaertner Oxspring. SE(44)2702; E.T.
Bidens tripartita L. Canal, Colne Bridge, HUDD. SE(44)1720; T.S.
Carex laevgata Smith Blackmoor Common, Thurgoland. SE(44)2700; L. L-E.
Narthecium ossifragum (L.) Hudson Park Gate, Langsett. SE(44)1910; L. L-E., Close Moss, Marsden. SE(44)0211; J.L.
Allium oleraceum L. High Melton, College Grounds. SE(44)5001; YNU Bot. Sectn. Excn.
Epipactis helleborine (L.) Crantz. Farnley Tyas, HUDD. SE(44)1613; T.S.

MID-WEST YORKSHIRE (VC64) (P. P. Abbott)

Huperzia selago Bernh. Middlesmoor 09/76; YNU Botany Section Excn.
Ophioglossum vulgatum L. Middlesmoor 09/76; YNU Botany Section Excn.
Berberis vulgaris L. Copgrove 33/63; E. Thompson.
Vaccinium vitis-idaea L. Burnsall and Thorpe Fell 00/59; J. & S. Hartley.
Anagallis tenella (L.) L. Burley-in-Wharfedale 15/46; J. & S. H. & F. Draper.

Chrysosplenium alternifolium L. Addingham Moorside 07/48; J. & S.H.
Rubus chamaemorus L. Burnsall and Thorpe Fell 00/59; J. & S.H.
R. nessensis W. Hall. Bishop Wood, near Selby 56/33; D.R.G.
R. sciocharis (Sudre) W. C. R. Watson. Hudson Wood, Ilkley 12/48; D.R.G.
Rosa mollis Smith. Wike 33/41; D.R.G.
Gentianella amarella ssp. septentrionalis (Druce) N. Pritch. Malham 8/6; P. P. Abbott & B. Burrow.
Nymphoides peltata Kunhtze Burley Mill Goyts. 16/42; L. Magee.
Myosotis stolonifera (DC.) Gay ex. Lcresche & Levier. Lofthouse 10/74; P.P.A.
Littorella uniflora (L.) Asch. Lower Barden Resr. 04/56; L.M.
Scrophularia umbrosa Dumort. Sawley 77/47; P.P.A.
Zannichellia palustris L. Hay-a-Park, Knaresborough 36/57; D.R.G. Burley-in-Wharfedale 15/46; J. & S.H. & F.D.
Eleocharis uniglumis (Link) Schultes. Hay-a-Park, Knaresborough 35/57; D.R.G.
Catapodium rigidum (L.) C. E. Hubb. Kirkstall Abbey; P.P.A.
Polygonatum odoratum (Miller) Druce. Kettlewell 9/7; P.P.A.
Allium scorodoprasum L. Copgrove 33/63; E.T.
Anacamptis pyramidalis (L.) Rich Hay-a-Park, Knaresborough 35/57; D.R.G.

NORTH-WEST YORKSHIRE (VC65) (T. F. Medd)

Hypericum montanum L. Gebdykes Quarry, Masham 44/28; H. Watson.
Rubus chamaemorus L. Black Hill, Gunnerside 34/99; J. Killick.
R. armeniacus Focke Maunby 44/38; YNU Bot. Sec. Excn. det. D.R.G.
R. echinatoides (Rogers) Dallman Maunby 44/38; YNU Bot. Sec. Excn. det. D.R.G.
R. eboracensis W. C. R. Watson Maunby 44/38; YNU Bot. Sec. Excn. det. D.R.G
Myriophyllum spicatum L. Manby 44/38; YNU Bot. Sec. Excn.
Chaenorhinum minus (L.) Lange Railway line, Ainderby Steeple 44/39; BSBI Excn.
Onopordum acanthium L. Ainderby Steeple 44/39 (confirmation); BSBI Excn.
Butomus umbellatus L. R. Swale, Maunby 44/38 (confirmation); YNU Bot. Sec. Excn.
Vulpia myuros (L.) C. Gmelin Ainderby Steeple 44/39; BSBI Excn. det. C. J. Lowe.
Puccinellia distans (Jacq.) Parl. Roadside, Ainderby Steeple 44/39; C. J. Lowe: also roadside, East Cowton 45/30; BSBI Excn.
Alopecurus myosuroides Hudson Ainderby Steeple 44/39; BSBI Excn.

CASUALS AND ADVENTIVES 1995/1996 (G. T. D. Wilmore)

Azolla filiculoides Lam. Stanley Ferry Flash, WFD. SE(44)3522; J. Martin.
Aconitum x *cammarum* L. Anston Stones Wood. SK(43)5283; G. T. D. Wilmore.
Papaver somniferum L. Tingley tip, WFD. SE(44)2826; J.M.
Alnus rubra Bong. Waste land, Goole. SE(44)7323; G. Appleyard.
Bassia scoparia (L.) A. J. Scott. Roadside verge, Goole. SE(44)7323; G.T.D.W. Detd. Dr. E. Chicken. Roadside verge, M66 slip road, BFD. SE(44)1630; B. A. Tregale.
Atriplex hortensis L. Shoddy tip, Rothwell Haigh. SE(44)3227; B.A.T.
Amaranthus retroflexus L. Shoddy tip. Rothwell Haigh. SE(44)3227; J.M.
A. hybridus L. Shoddy tip, Rothwell Haigh. SE(44)3227; J.M.
A. thunbergii Moq. Shoddy tip, Rothwell Haigh. SE(44)3227; J.M.
Herniaria hirsuta L. Shoddy dump, Ouzelwell Green. SE(44)347259; J.M. Detd. E. J. Clement. 1995.
Fallopia sachalinensis (F. Schmidt ex Maxim.) Ronse Decraena Tingley tip, WFD. SE(44)2826; J.M., River Aire Banking, Kirkstall, Leeds. SE(44)2536; J.M.
Rumex pseudoalpinus Hoefft Dacre. SE(44)1860; P. P. Abbott.
Sisymbrium irio L. Shoddy tip. Rothwell Haigh. SE944)3227; J.M.
S. loeselii L. Shoddy tip, Rothwell Haigh. SE(44)3227; J.M.
Sisymbrium orientale L. Roadside. Rothwell Haigh. SE(44)3228; J.M.

Barbarea verna (Miller) Asch. Waste ground, Clapham. SD(34)7469; G.T.D.W.
Camelina sativa (L.) Crantz. Tingley tip, WFD. SE(44)2826; J.M. cnfd. B. A. Tregale.
Neslia paniculata (L.) Desv. Tingley tip, WFD. SE(44)2826; J.M. Detd. E. J. Clement.
Sinapis arvensis L. var. *orientalis* (L.) Koch & Ziz. Tingley tip, WFD. SE944)2826; J.M Detd. E. J. Clement.
Rapistrum rugosum (L.) Bergeret Footpath side, Rothwell Haigh. SE(44)3228; J.M.
Sedum spurium M. Bieb. Waste ground, Tingley, WFD. SE(44)2826; P.P.A.
Darmera peltata (Torrey ex Benth.) Vossex Post Kuntze Ingleborough Hall, Clapham SD(34)7469; P.P.A.
Sorbus croceocarpa Sell Kings Rd. BFD. SE(44)1634; B.A.T. Confd. G. T. D. Wilmore.
Cotoneaster dielsianus E. Pritzex Diels Bolton Lane, BFD. B.A.T. Confd. G. T. D Wilmore.
Colutea arborescens L. Balby, Doneaster. SE(44)5602; G.T.D.W.
Tetragonolobus maritimus (L.) Roch Roadside verge Castleford. SE(44)4426; G.T.D.W.
Securigera varia (L.) Lasson Railway bank, Goole. SE(44)4426; G.T.D.W.
Melilotus indicus (L.) All. Shoddy tip, Rothwell Haigh. SE(44)3227; J.M.
Medicago laciniata (L.) Miller Shoddy fields, Rothwell Haigh. SE(44)3227; J.M.
Trifolium tomentosum L. Esholt Sewage Works tip, BFD. SE(44)1739; P.P.A.
T. hirtum All. Shoddy field, Rothwell Haigh. SE(44)3227; J.M.
T. angustifolium L. Esholt Sewage Works tip, BFD. SE(44)1739; P.P.A.
T. echinatum M. Bieb. Esholt Sewage Works tip, BFD. SE(44)1739; P.P.A.
Oenothera fallax Renner Waste ground, Austerfield. SK(44)1632; G.T.D.W.
Vitis vinifera L. Woodhouse tip, Lumbutts, Todmorden. SD(43)9523; C. Newell. 1995.
Erodium botrys (Cav.) Bertol. Shoddy dump, Ouslewell Green. SE(44)3425; J.M. 1995.
Erodium brachycarpus (Godron) Thell. Shoddy fields, Rothwell Haigh. S(944)3227; J.M Confd. P.P.A. & G.T.D.W.
Tropaeolum majus L. Tingley tip, WFD. SE(44)2826; J.M.
Ammi majus L. Waste ground near City Hall, BFD. SE(44)1632; G.T.D.W.
Lycropersicon esculentum Miller Tingley tip, WFD. SE(44)2826; J.M.
Solanum tuberosum L. Tingley tip, WFD. SE(44)2826; J.M.
S. rostratum Dunal Shoddy fields, Ouselwell Green. SE(44)3425; J.M.
Datura stramonium L. Shoddy fields, Rothwell Haigh. SE944)3328; J.M.
Melissa officinalis L. Boston Spa. SE(44)4345; Leeds Nats. Soc.
Mimulus moschatus Douglas ex Linsley Lofthouse. SE(44)1074; P.P.A.
Antirrhinum majus L. Tingley tip, WFD. SE(44)2826; J.M.
Linaria purpurea (L.) Miller Tingley tip, WFD. SE(44)2826; J.M.
Campanula persicifolia L. Dacre. SE(44)2060; P.P.A.
Lobelia erinus L. Collingham. SE(44)3846; P.P.A.
Leycesteria formosa Wallieh Boston Spa. SE(44)4345; Leeds Nats. Soe.
Lonicera nitida E. Wilson Pateley Bridge. SE(44)1565; P.P.A.
Cephalaria gigantea (Ledeb.) Bobrov Baildon Green, Baildon. SE(44)1438; M. Midgley, Confd. G. T. D. Wilmore.
Carduus pycnocephalus L. Shoddy tip, Rothwell Haigh. SE(44)3227; J.M.
Centaurea calciptrapa L. Shoddy dump, Kirkhamgate, WFD. SE(44)3023; J.M.
Anthemis tictoria L. Old Railway bank, Goole. SE(44)7323; G.T.D.W.
Xanthium spinosum L. Shoddy fields, Rothwell Haigh. SE(44)3227; J.M.
Phalaris canariensis L. Tingley tip, WFD. SE(44)2826; J.M.
Polypogon monspeliensis (L.) Desf. Shoddy dump, Kirkhamngate, WFD. SE(44)3023; J.M. 1995.
Hordeum geniculatum All. Shoddy dump, Rothwell Haigh. SE(44)3227; J.M.
Panicum miliaceum L. Tingley tip, WFD. SE(44)2826; J.M.
Setaria pumila (Poiret) Roemer & Schultes Tingley tip, WFD. SE(44)2826; J.M.
S. verticillata (L.) P. Beauv. Shoddy fields, Rothwell Haigh. SE(44)3227; J.M.
S. viridis (L.) Beauv. Waste ground, nr, City Hall, BFD. SE(44)1632; B.A.T.

Tulpa gesneriana L. Sawley. SD(34)7946; P.P.A.
Lilium martagon L. Kettlewell. SD(34)9772; P.P.A.
Nectaroscordum siculum (Ulria) Lindley Ingleborough Hall Estate, Clapham. SD(34)7569; P.P.A.
Galnthus ikariae Baker Edge of wood, Shipley Glen, Shipley. SE(44)1338; B.A.T. confd. G. T. D. Wilmore.
Crocus tommasinianus Herbert Bank of R. Aire, Roberts Park, Saltaire, Shipley. SE(44)1438; B.A.T.
Crocosmia x *crocosmiiflora* (Lemoine ex Burb. & Dean) N.E. Br. Tingley tip, WFD. SE(44)2826; J.M.

WANSFORD TO DRIFFIELD SITE OF SPECIAL SCIENTIFIC INTEREST

F. E. CRACKLES
143 Holmgarth Drive, Bellfield Avenue, Hull HU8 9DX

This site was visited by the Yorkshire Naturalists' Union in June, 1960 (Sledge, 1960). Later that summer I found a belt of *Carex paniculata* L. x *C. diandra* Schrank = *C.* x *beckmannii* K. Keck ex Schultz between populations of the two parents. This hybrid had not previously been recorded in the British Isles. An account. of the hybrid is given in Crackles (1983).

In 1963, I found a Marsh Orchid on the site which I was unable to name. Eventually photographs of the whole plant and of individual spikes were sent to R. H. Roberts, the referee for the Botanical Society of the British Isles, who was astonished to find that it was that taxon, new to science, found on Anglesey in 1960 and named by him *Dactylorhiza majalis* (Reichb.) P. Hunt & Summerh. *subsp. cambrensis* (Roberts) Roberts (see Crackles 1986).

Other marsh species on the site are:
Equisetum fluviatile L. Water Horsetail r
Equisetum palustre L. Marsh Horsetail lf
Caltha palustris L. Marsh Marigold f
Ranunculus sceleratus L. Celery-leaved Buttercup occ
Ranunculus flammula L. Lesser Spearwort occ
Stellaria uliginosa Murray Bog Stitchwort occ
Lychnis flos-cuculi L. Ragged-Robin occ
Hypericum tetrapterum Fries Square-stalked St John's-wort occ
Rorippa nasturtium-aquaticum (L.) Hayek Water-cress occ
Cardamine pratensis L. Cuckooflower lf
Parnassia palustris L. Grass-of-Parnassus r Uncommon in VC61
Filipendula ulmaria (L.) Maxim Meadowsweet occ
Potentilla palustris (L.) Scop. Marsh Cinquefoil lf Uncommon in VC61
Lotus pedunculatus Cav. Greater Bird's-foot-trefoil c
Epilobium hirsutum L. Great Willowherb c
Epilobium palustre L. Marsh Willowherb occ
Angelica sylvestris L. Wild Angelica f
Menyanthes trifoliata L. Bogbean lab Uncommon in VC61
Myosotis scorpioides L. Water Forget-me-not occ
Mentha aquatica L. Water Mint lf
Stachys palustris L. Marsh Woundwort r
Scrophularia auriculata L. Water Figwort occ

Veronica beccabunga L. Brooklime occ
Veronica catenata Pennell Pink Water-speedwell on mud r
Pinguicula vulgaris L. Common Butterwort r Uncommon in VC61
Pedicularis palustris L. Marsh Lousewort lf Uncommon in VC61
Galium uliginosum L. Fen Bedstraw occ
Galium palustre L. Marsh Bedstraw f
Valeriana officinalis L. Common Valerian f
Valeriana dioica L. Marsh Valerian lf
Succisa pratensis Moench Devil's-bit Scabious r
Senecio aquaticus Hill Marsh Ragwort r
Crepis paludosa Moench Marsh Hawk's-beard r
Triglochin palustre L. Marsh Arrowgrass occ
Juncus subnodulosus Schrank Blunt-flowered Rush ldom
Juncus effusus L. Soft Rush occ
Juncus inflexus L. Hard Rush occ
Eriophorum angustifolium Honck. Common Cottongrass r
Eleocharis palustris (L.) Roemer & Schultes Common Spike-rush f
Eleocharis uniglumis (Link) Schultes Slender Spike-rush lf Uncommon in VC61
Eleocharis quinqueflora (F. Hartmann) O. Schwarz Few-flowered Spiike-rush Uncommon in VC61
Blysmus compressus (L.) Panzer ex Link Flat-sedge r Uncommon in VC61
Carex paniculata L. Greater Tussock-sedge ldom
Carex diandra Schrank Lesser Tussock-sedge lf Uncommon in VC61
Carex disticha Hudson Brown Sedge c
Carex echinata Murray Star Sedge r Uncommon in VC61
Carex dioica L. Dioecious Sedge r Uncommon in VC61
Carex acutiformis Ehrh. Lesser Pond-sedge occ
Carex rostrata Stokes Bottle Sedge lf
Carex flacca Schreber Glaucous Sedge f
Carex panicea L. Carnation Sedge c
Carex hostiana DC. Tawny Sedge occ Uncommon in VC61
Carex viridula Michaux subsp. *brachyrryncha* (Celak.) B. Schmid Long-stalked Yellow sedge f Uncommon in VC61
Carex nigra (L.); Reichard Common Sedge occ
Deschampsia cespitosa (L.) Beauv. Tufted Hair-grass f
Alopecurus geniculatus L. Marsh Foxtail f
Iris pseudacorus L. Yellow Iris occ
Epipactis palustris (L.) Crantz Marsh Helleborine c. 40 plants Uncommon in VC61
Dactylorhiza fuchsii (Druce) Soó Common Spotted-orchid
Dactylorhiza fuchsii (Druce) Soó x *D. incarnata* (L.) Soó
Dactylorhiza incarnata (L.) Soó subsp. *incarnata* Early Marsh-orchid occ Uncommon in VC61
Dactylorhiza incarnata (L.) Soó subsp. *pulchella* (Druce) Soó r Uncommon in VC61

Key to symbols: ab = abundant, c = common, f = frequent, occ - occasional, r = rare, l = locally.

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Crackles, F. E. (1986). *Dactylorhiza majalis* (Reichb.) P. F. Hunt & Summerhayes subsp. *cambrensis* (R. H. Roberts) R. H. Roberts in S.E. Yorkshire. *Watsonia* **16**: 78-80.

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